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ABSTRACT

The purpose of this guide (intended for use by special education teachers, regular education teachers, environmental educators, park naturalists, therapeutic recreation specialists, and anyone else interested in learning how to make environmental education accessible to all students regardless of their ability level) is to show educators how they can use already existing environmental education materials with students who have physical, developmental, and behavioral disabilities. Section 1 provides an overview and offers a philosophy of environmental education for all students that includes those with disabilities. Information on inclusion and appropriate communication is also reviewed. Section 2 focuses on adapting environmental education activities for inclusive groups and the factors to consider when modifying activities. Section 3 contains activities and their adaptations developed by teachers. Section 4 discusses getting involved in community service projects while section 5 discusses lessons learned by using this resource guide. The appendix contains an annotated bibliography divided into the following categories: (1) Environmental Education-General Activity Guides and Curricula; (2) Environmental Education-Community and Action Projects; (3) Environmental Education for Students with Disabilities; (4) Outdoor Education/Camping/Adventure Programs for People with Disabilities; (5) Science for Students with Disabilities; (6) Inclusion-Environmental/Outdoor Education; (7) Inclusion-General Resources; (8) Disability Resources; and (9) Resource List for Recreation, Integration and Advocacy. (JRH)

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Unlimited Classrooms

A Resource Guide for Inclusive Environmental Education



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Recreation Unlimited—National Challenge Center for People with Disabilities

Unlimited Classrooms

A Resource Guide for Inclusive Environmental Education

Karen T. Ricker, Gina J. Freeman, Ph.D., and R. David Hoy



**Recreation Unlimited—National Challenge
Center for People with Disabilities**



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*"If this is not a place
my spirit can take wing,
where do I go to fly?"*

Ken Medema
Recreation Unlimited participant

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We are interested in your comments about this publication, particularly any comments about how you used the suggestions in this book to adapt activities. Please send your comments or suggestions to Recreation Unlimited.



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Contents

Acknowledgments	v
Introduction	vii
Who Should Use This Book	
Purpose of the Resource Guide	
What's Contained in These Pages	
Section 1: An Overview	1
Development of This Resource Guide	
Philosophy of Environmental Education for Students Regardless of Their Abilities or Disabilities	
Principles of Inclusion	
Recent Movement Toward Equality for People With Disabilities	
Appropriate Communication	
Handicap or Disability?	
Appropriate Terminology	
Recreation Unlimited and the Residential Outdoor Education Experience	
Ten Commandments for Communicating With Persons With Disabilities	
Section 2: Adapting Environmental Education Activities for Students with Disabilities	9
General Guidelines	
Adapting Activities for Inclusive Settings	
Factors to Consider When Adapting Activities	
Field-tested Suggestions for Adapting Activities for Inclusive Groups	
Project Ohio Outdoor Access: Design, Activities, and Participants	
Information About Project Learning Tree, Project WET, and Project WILD	
Section 3: The Classes and the Activities	19
How to Use This Section	20
Elementary School Level	21
Teacher and Class Descriptions	
Why These Activities Were Selected	
<i>Looking At Leaves</i> (Original Activity)	
<i>Looking At Leaves</i> Adaptation	
<i>Cold Cash in the Ice Box</i> (Original Activity)	
<i>Cold Cash in the Ice Box</i> Adaptation	
<i>What's Wild</i> (Original Activity)	
<i>What's Wild</i> Adaptation	
Other Considerations	
Middle School Level	44
Teacher and Class Descriptions	
Why These Activities Were Selected	
<i>Pass the Plants, Please</i> (Original Activity)	
<i>Pass the Plants, Please</i> Adaptation	
<i>A-maze-ing Water</i> (Original Activity)	
<i>A-maze-ing Water</i> Adaptation	
<i>The Thicket Game</i> (Original Activity)	
<i>The Thicket Game</i> Adaptation	
Other Considerations	

High School Level	68
Teacher and Class Descriptions	
Why These Activities Were Selected	
<i>Dynamic Duos</i> (Original Activity)	
<i>Dynamic Duos</i> Adaptation	
<i>Raining Cats and Dogs</i> (Original Activity)	
<i>Raining Cats and Dogs</i> Adaptation	
<i>Wildwork</i> (Original Activity)	
<i>Wildwork</i> Adaptation	
Other Considerations	
Section 4: Into the Community	95
Why Get Involved in Community Service Projects?	
Project Descriptions:	
A gardening project with middle school students who have developmental disabilities	
Middle school students with multiple disabilities share environmental activities with senior citizens	
A gardening project with elementary school students who have multiple disabilities	
Section 5: Conclusion	101
Appendices	103
Appendix A: Glossary	
Appendix B: Annotated Bibliography	

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Introduction

Who Should Use This Book

Unlimited Classrooms: A Resource Guide for Inclusive Environmental Education is intended to be used by special education teachers, regular education teachers, environmental educators, park naturalists, therapeutic recreation specialists, and anyone else interested in learning how to make environmental education accessible to all students regardless of their ability levels.

As the title of this resource guide suggests, the environment where learning can occur is virtually *unlimited*. When we discuss the idea of a *classroom* we mean a place where learning and discovery occur. This can be any setting—a woodlot, a beach, a field, a parking lot, a schoolroom. The concept of “classroom” is unlimited, as long as the learners are in an environment that nurtures and encourages learning, and where students can be *actively* involved in their learning. *Inclusive* environmental education means making environmental education accessible, obtainable, and feasible for students with developmental, physical, and behavioral disabilities. It also means giving them the opportunity to participate equally in environmental education activities with their non-disabled peers.

Purpose of this Resource Guide

The main purpose of this resource guide is to show educators how they can use *already* existing environmental education materials with students who have physical, developmental, and behavioral disabilities. It isn’t necessary for educators to re-write their curriculum to accommodate students with disabilities. In many instances all that is needed are modifications to the materials or methods used to conduct the activity. Therefore, this resource guide emphasizes the processes used to adapt and modify environmental education activities for use by inclusive as well as self-contained special education classes.

This book is based on a pilot-project that involved nine groups of students and their teachers from school districts in central Ohio. Students with physical, developmental, and behavioral disabilities participated in the project; one regular education class participated also. The teachers field-tested a set of environmental education activities with their classes, and focused on how they made the activities “work” for their students. We hope you find their suggestions helpful and that you can adapt these ideas for your use.

What’s Contained in These Pages

Although the basic intent of this resource guide is to show how to adapt environmental education activities for students with disabilities, information on disability awareness, inclusion, community projects, and other resources are also included.

Section 1 provides an overview of the resource guide and offers a philosophy of environmental education for all students including those with disabilities. Information on inclusion and appropriate communication is also reviewed.

Section 2 focuses on adapting environmental education activities for inclusive groups and the factors to consider when modifying activities. Information on the project design and participants is also included in this section.

Section 3 is the heart of the resource guide. Here is where you’ll get to know the teachers and their students, and see the processes used by the teachers for adapting the activities during the field-testing. The original activities are reprinted followed by the adaptations. This section also includes a dialogue with each teacher group by grade level.

Section 4 discusses getting involved in community service projects. Three projects conducted by the teachers are highlighted.

Section 5 discusses the “lessons” learned by using this resource guide.

Appendix A is a glossary of terms about different disabilities and issues.

Appendix B provides an annotated bibliography that is divided into nine categories:

- Environmental Education: General Activity Guides and Curricula
- Environmental Education: Community and Action Projects
- Environmental Education for Students with Disabilities
- Outdoor Education/Camping/Adventure Programs for People with Disabilities
- Science for Students with Disabilities
- Inclusion: Environmental/Outdoor Education
- Inclusion: General Resources
- Disability Resources
- Resource List for Recreation, Integration and Advocacy

Section 1: An Overview

- Development of This Resource Guide
- Philosophy of Environmental Education for Students Regardless of Their Abilities or Disabilities
- Principles of Inclusion
- Recent Movement Toward Equality for People With Disabilities
- Appropriate Communication
- Handicap or Disability?
- Appropriate Terminology
- Recreation Unlimited and the Residential Outdoor Education Experience
- Ten Commandments for Communicating With Persons With Disabilities



"The real key is getting ... teachers to understand that these kids [with disabilities] are able to participate and learn."

Irene Stephens, teaches students with physical disabilities

Development of This Resource Guide

What is it that we are trying to accomplish when we take a class of special education or inclusive students into the outdoor environment? Is it worth the extra time and effort to adapt environmental education activities for such classes? Based on feedback from teachers, school administrators and students, we can now answer these questions with a resounding YES!

When we initially began to investigate the best way to include students with special needs in environmental education activities, we received feedback from the teaching staff at Recreation Unlimited and from many special education teachers that “too much time and effort” was required to develop adaptations for environmental education activities. When searching for materials to address these concerns, we found few current resources that focused specifically on environmental education for students with disabilities, especially developmental disabilities.

After surveying other teachers and professionals in the environmental education field in Ohio, we realized that there was a need for a resource that would model how to adapt activities for students with special needs. It was this discovery that led to the creation of Project Ohio Outdoor Access. If we wanted to promote environmental education for students with disabilities, then we needed to provide educators with a resource guide of field-tested approaches for modifying activities. We did not want to create another collection of environmental education activities since many outstanding programs already exist. Instead, we wanted to focus on the processes used to adapt already existing environmental education materials for students with a wide range of ability levels.

With much encouragement and support from environmental education professionals, special education teachers, other outdoor residential centers, and school system administrators, we wrote a grant application for Project Ohio Outdoor Access through the Ohio Environmental Protection Agency’s Environmental Education Fund. Funding for the project was also contributed by Recreation Unlimited. Our final project goal was to develop a resource guide that would increase involvement of special education and inclusive classes in environmental education activities. We wanted the guidelines and adaptations to come from those who know best: the teachers and their students. The adaptations and modifications described in Section 3 are taken directly from the field-testing conducted by the teachers and their students. The final outcome of the project is now in your hands.

Philosophy of Environmental Education for Students Regardless of Their Abilities or Disabilities

The Ohio Department of Education vision statement opens with the belief that “*all students can learn and that all students will learn if the conditions for learning are right.*” It is our belief that having an environmental education component adapted to the needs of students is essential for making conditions “right” for learning.

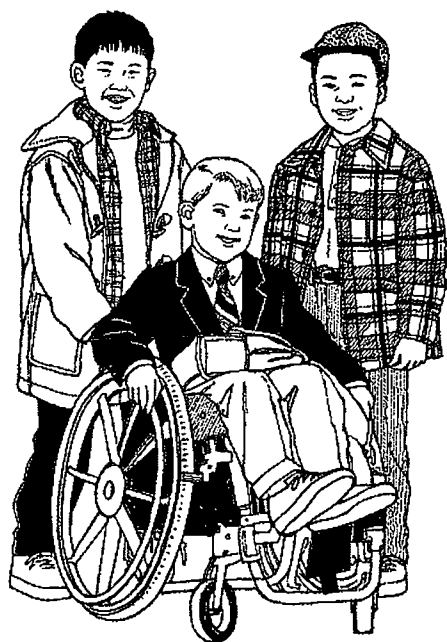
The goal of education is to foster the development of life-long learners, capable decision-makers and problem solvers who will make valuable contributions to our society and to our world. With a finite and rapidly shrinking amount of natural resources on our Earth, coupled with an expanding rate of population growth, it is imperative that we foster and facilitate learning in and about our environment with each and every student, regardless of ability, if we hope to accomplish this goal.

Hands-on interaction with the natural environment certainly offers students the opportunity to develop and enhance their relationship with the Earth. Personal experiences will provide students a basis for forming their attitudes and values about the natural environment. Providing environmental education activities that have been adapted to the needs of your students (such as the ones in this resource guide) will certainly provide these experiences for your classes.

Environmental education activities can promote a student-centered approach to learning. As a facilitator of learning, you can help students actively participate in hands-on experiences by selecting activities that relate to curriculum or Individualized Education Program (IEP) goals. The ultimate goal of this student-centered approach is the students’ participation in their own curriculum. As students progress through the school system, the activities provided should be more challenging and adapted to students’ needs and interests. Getting involved in actual “real-life” service projects within the community, developing land labs or learning areas on school grounds, developing environmental education activities for community parks, and working with area businesses to enhance or clean-up a certain location in local neighborhoods requires students to make decisions, solve problems, work together with community resources and practice implementing projects that reflect stewardship and wise use of our natural resources.

Experiential, hands-on activities also offer a different learning modality for students than the

classroom. For the special education student who has been labeled “learning disabled” it may mean a whole new way of learning. The classroom may not be the “least restrictive environment” for your students in terms of learning styles—it may be the outside environment. The learner-centered approach focuses on the student and his or her needs and interests. By providing various learning environments and experiential activities, students have the opportunity to seek and find the condition for learning that is “right” for them. Information gained about the students’ learning styles by participating in environmental education activities will be valuable to educators and parents as they develop curriculum, IEP goals, and assessment strategies.



Principles of Inclusion

The Division of Special Education in the Ohio Department of Education developed and monitored four experimental models related to inclusion. The model which garnered the greatest support and success, according to teachers was Model #4:

Special educators serve students with disabilities as needed, where needed. Services may be provided in a regular education classroom with the regular education teacher, in a learning center, and/or in a special education classroom. The special educator may serve as a consultant, a teacher, and/or a tutor. This model provides services based on the needs of students and may incorporate components of the other three models.

The goal of inclusion is to have all students learn together, work together, play and grow together. Inclusion also means:

- Less exclusion.
- More students with disabilities in regular environments, more of the time, in more meaningful activities.
- Additional state-supported options for meeting the individual needs of students.
- Mainstreaming students plus offering support, resources, and help.
- Special education must be defined as a service, *not* a place.
- IEP teams will continue to determine the type of services students with disabilities receive.
- Inclusion into society is the ultimate goal of the Americans with Disabilities Act. Promoting inclusive settings during environmental education activities benefits students and society.

Reprinted and adapted with permission from Highlights In Special Education, 1993, Vol. 14 (1). For more information on this publication contact the Ohio Department of Education, Division of Special Education, 933 High St., Worthington, OH 43085-4087; 614-466-2650.

Recent Movement Toward Equality for People With Disabilities

Since the mandates of the Rehabilitation Act of 1973, the Individuals with Disabilities Act (IDEA) of 1990, the Americans with Disabilities Act (ADA) of 1990, and the advocacy of many consumer groups, an attitudinal change in our society towards people with disabilities has been realized. For more information about these pieces of legislation, please refer to the glossary in Appendix A. Because of the efforts of many concerned individuals, affirmative action to increase employment for individuals with disabilities has increased, ramp construction has continued making buildings more accessible, and a more realistic portrayal of individuals in the media exists.

These developments have allowed society to recognize that people with disabilities are capable and productive members of society. However, there are still some people who believe that people with disabilities are somehow “inferior” and should be pitied, feared or ignored. These attitudes may arise from fearing someone who looks or acts different from you.

Appropriate Communication

A person with a disability is—first and foremost—a person. “People first terminology” resulted from consumers with disabilities who came together prior to the establishment of the ADA to agree on how they wish to be described when it is necessary to use a description. Ten to fifteen percent of the population (approximately 43 million people in the United States) have a disability which impacts at least one or two activities of daily living. Attitudinal barriers limit other people’s perception of the potential of people with disabilities to be capable, independent individuals. Attitudinal barriers include prejudice, ignorance, fear, insensitivity, bigotry, stereotyping, misconception, discrimination, dislike, insecurity, discomfort, tension, and intolerance.

Positive attitudes which focus on *abilities* help create relationships with people who have disabilities that are appropriate and positive.

Adapted and reprinted with permission from Taking the Handicap out of Disability, 1992. For more information contact the State of Ohio, Governor's Council on People with Disabilities, 400 E. Campus View Blvd., Columbus, OH 43235-4604; 614-438-1391; 1-800-282-4536, ext. 1391 (V/TDD).

Handicap or Disability?

It is easy to confuse the term “handicap” with the term “disability.” We use the term “disability” to describe the result of an impairment—part of a person’s body does not function in a typical way. A disabling condition may or may not be handicapping. A “handicap” occurs when the disability interacts with something in the environment, such as an attitude or a curb, which creates a barrier for the individual with a disability.

For example, a person who is blind has a physical disability. This person is handicapped when he or she does not know which room to enter because the door signs are readable only by sight.

Putting the person first means observing the Golden Rule (treat others as you would want to be treated). When communicating, it goes one step further; it means that whenever possible, mention the person first, and follow with any necessary description of a disability.

Say, *the woman who is blind* instead of *the blind woman*. In other words, the person is first a person and second, a person with a disability. And just as it isn’t always necessary to convey the color of a person’s hair, it is also not always necessary to mention that a person has a disability.

The information in “Handicap or Disability?” was adapted and reprinted with permission from Person First, AXIS Center for Public Awareness of People with Disabilities, 4550 Indianola Ave., Columbus, OH 43214; 800-231-2947 (V/TTY); 614-267-4550 (fax). Copyright 1992, McGuire-Willis & Associates, Columbus, OH.

Appropriate Terminology

Listed below are disability-related terms and preferred words that reflect a positive attitude in portraying disabilities.

Blind: Describes a condition in which a person has loss of vision for ordinary life purposes. *Visually impaired* is the generic term preferred by some individuals to refer to all degrees of vision loss. Use *boy who is blind*, *girl who is visually impaired*, or *man who has low vision*.

Brain Injury: Describes a condition where there is temporary or long-term disruption in brain functioning resulting from injury to the brain. Difficulties with cognitive, physical, emotional or social functioning may occur. Use *person with a head injury*, *woman who has sustained brain injury*, or *boy with an acquired brain injury*.

Cleft Lip: Describes a specific congenital disability involving lip and gum. The term “hare lip” is anatomically incorrect and stigmatizing. Use *person who has a cleft lip* or *has a cleft palate*.

Congenital Disability: Describes a disability that has existed since birth but is not necessarily hereditary. The term “birth defect” is inappropriate.

Deaf: Deafness refers to a profound degree of hearing loss that prevents understanding speech through the ear. *Hearing impaired* or *hearing loss* are generic terms used by some individuals to indicate any degree of hearing loss, from mild to profound. These terms include people who are hard of hearing and deaf. However, some individuals dislike the term hearing impaired and prefer to use *deaf* or *hard of hearing*. Hard of hearing refers to a mild to moderate hearing loss that may or may not be corrected with amplification. Use *woman who is deaf*, *boy who is hard of hearing*, *individuals with hearing losses*, or *people who are deaf or hard of hearing*.

Developmental Disability:* Approximately two of every one hundred Americans have a developmental disability. The federal government and Ohio define a developmental disability as a severe, chronic disability of a person that:

- Is attributable to a mental or physical impairment or combination of mental and physical impairments.
- Is manifested before a person reaches age 22.
- Is likely to continue indefinitely.
- Results in substantial functional limitations in three or more of the following areas of major life activity: self-care; receptive and expressive language; learning; mobility; self-direction; capacity for independent living; and economic self-sufficiency.
- Reflects the person's need for a combination and sequence of special interdisciplinary or generic care, treatment, or other services that are of life-long or extended duration and are individually planned and coordinated. Ohio bases eligibility for services on a person's degree of limitation in various areas of life activity.

Use *person with a developmental disability*.

Disability: General term used for a functional limitation that interferes with a person's ability, for example, to walk, lift, hear, or learn. It may refer to a physical, sensory, or mental condition. Use as descriptive noun or adjective, such as *person living with muscular dystrophy*, *woman who is blind*, or *man with a disability*. The term "impairment" refers to loss or abnormality of an organ or body mechanism, which may result in disability.

Disfigurement: Refers to physical changes caused by burns, trauma, disease, or congenital problems.

Down Syndrome:* Describes a chromosomal disorder that occurs in one out of every 800 to 1100 births. Most individuals with Down syndrome show some delays in development. The occurrence of Down syndrome is not related to race, socio-economic level, or parental intelligence. "Mongol" and "mongoloid" are unacceptable terms. Use *person with Down syndrome*.

Handicap: Not a synonym for disability. Describes a condition or barrier imposed by society, the environment, or by one's own self. Some individuals prefer the terms *inaccessible* or *not accessible* to describe social and environmental barriers. The term "handicap" can be used when citing laws and situations but should not be used to describe a disability. Do not refer to people with disabilities as "the handicapped" or "handicapped people." Say, *the building is not accessible for a wheelchair-user* or *the stairs are a handicap for her*.

Learning Disability: Describes a permanent condition that affects the way individuals with average or above-average intelligence take in, retain, and express information. Some groups prefer *specific learning disability*, because it emphasizes that only certain learning processes are affected. Do not say "slow learner," "retarded," etc. Use *person with a learning disability* or specify the disability: *person with an auditory learning disability*.

Mental Retardation: Refers to a substantial intellectual delay which requires a person to have environmental or personal support in order to live independently. Mental retardation is manifested by below average intellectual functioning in two or more life areas (work, education, daily living, etc.) and is present before the age of 18. Use the preferred term *people with mental retardation*.

Non-disabled: Appropriate term for people without disabilities. "Normal," "able-bodied," "healthy," and "whole" are inappropriate. Many organizations prefer to use *people without disabilities*.

Psychiatric Disability: Words such as "crazy," "maniac," "lunatic," "demented," and "psycho" are offensive and should never be applied to people with mental health problems. Psychotic, schizophrenic, neurotic, and other specific terms should be used only in proper context and checked carefully for medical and legal accuracy. Acceptable terms are *people with psychiatric disorders*, *psychiatric illness*, *emotional disorders*, or *mental disabilities*.

Seizure: Describes an involuntary muscular contraction, a brief impairment or loss of consciousness resulting from a neurological condition such as epilepsy or from an acquired brain injury. Instead of using the term "epileptic," say *girl with epilepsy* or *boy with a seizure disorder*. The term "convulsion" should be used only for seizures involving contraction of the entire body.

Small/Short Stature: Do not refer to people under 4'10" as "dwarfs" or "midgets." Use *person of small (or short) stature*. Dwarfism is an accepted medical term, but it should not be used as general terminology. Some groups prefer "little people;" however, that term implies a less than full, adult status.

Spastic: Describes a muscle with sudden abnormal and involuntary spasm. This is not an appropriate term for describing someone with cerebral palsy or a neurological disorder. Muscles are spastic, not people.

Special: Describes something that is different or uncommon about a person. This term is still used in the educational sector. Use this term with discretion to describe people with disabilities.

Speech Disorder: A condition in which a person has limited or difficult speech patterns. Use *child who has a speech disorder*. For a person with no verbal speech capability, use *woman without speech*. Do not use “mute” or “dumb.”

Spinal Cord Injury: Describes a condition in which there has been permanent damage to the spinal cord. Quadriplegia denotes substantial or total loss of function in all four extremities. Paraplegia refers to substantial or total loss of function in the lower part of the body only. Say, *man with paraplegia*, *woman who is paralyzed*, or *person with a physical disability*.

Stroke: Caused by interruption of blood to the brain. Hemiplegia (paralysis on one side) may result. *Stroke survivor* is preferred over “stroke victim.”

For other disability definitions and descriptions, please refer to the glossary in Appendix A.

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Recreation Unlimited and the Residential Outdoor Education Experience

Founded in 1960, Recreation Unlimited—National Challenge Center for People with Disabilities, is a 501 (C) 3 not-for-profit institution serving persons who are physically and developmentally disabled. The organization’s mission is “to provide programs in a recreational environment for people with disabilities which enhance the quality of life for all participants.”

Located on 160 acres, a 35-minute drive northeast of Columbus, Ohio, the year-round campus features

three major housing cabins, a multi-purpose lodge, an arts and crafts building, dining hall, swimming and diving pools, an athletic track and field, a tennis and sports court, regulation softball field, equestrian complex, medical clinic, administrative offices and related support buildings. The spacious cedar facilities are interconnected by a comprehensive system of nature trails with observation points for viewing waterfowl and wildlife. More than three miles of hard-surfaced trails are available. A six-acre lake, prairie, forest, stream, natural amphitheater and shelters provide an ideal environment for nature programs and outdoor education activities. Opened in 1989, the campus is fully accessible and annually serves over 5,000 individuals with disabilities primarily from Ohio and adjacent states.

Recreation Unlimited offers a residential outdoor education program for teachers and their students from the central Ohio area and beyond. During a three- to four-day overnight experience the outdoor environment is the classroom where many experiential opportunities exist. Teachers and Recreation Unlimited program staff teach sessions jointly. Topics and activities include: prairie studies, animal studies, challenge education, initiatives/team building, nature crafts, outdoor living skills, aquatic education and fishing, and survival skills.

For other programs, the organization has introduced persons with disabilities to water skiing, downhill and cross country skiing, ice skating, back-packing, canoeing, sailing, competitive cycling, wheelchair sports, white-water rafting, and kayaking.

As you walk around the Recreation Unlimited campus, you’ll hear staff say that we project an “I Can” philosophy and we focus on the abilities rather than disabilities of people. The “I Can” philosophy emphasizes the positive. We do not say “I Can’t” and we challenge those who do say this to come up with a way or an idea to accomplish all that a person desires. We also encourage independence, and encourage our campers to “do for themselves” when they are capable, even if they are not used to taking care of themselves.

Recreation Unlimited program goals include the following:

- Providing individuals with disabilities the opportunity to fully develop their knowledge, physical, social and affective abilities in selected recreational activities based on their individual needs.
- Educating campers and other staff members about our natural environment and the impact that humans have on this environment.
- Utilizing the recreational setting at Recreation Unlimited and beyond to promote positive human

relationships, attitudes, and behavior among campers and counselors.

- Providing an opportunity for people to explore their physical, social, and emotional potential in cooperative and competitive activities both at Recreation Unlimited and in the community.
- Providing individuals with a wide variety of recreational activities, both active and passive, and the resources necessary to develop their skills in the least restrictive setting.
- Educating people about the meaningful use of leisure time.

Where Do I Go?

If this is not a place where tears are understood,

Where do I go to cry?

If this is not a place where my spirit can take wing,

Where do I go to fly?

If this is not a place where my questions can be asked,

Where do I go to seek?

If this is not a place where my feelings can be heard,

Where do I go to speak?

If this is not a place where you'll accept me as I am,

Where can I go to be?

If this is not a place where I can try, and learn, and grow,

Where can I just be me?

Ken Medema

Recreation Unlimited participant

Ten Commandments For Communicating with Persons with Disabilities

1. When talking with a person with a disability, speak directly to that person rather than through a companion or sign language interpreter who may be present.
2. When introduced to a person with a disability, it is appropriate to offer to shake hands. People with limited hand use or who wear an artificial limb can usually shake hands (shaking hands with the left hand is an acceptable greeting).
3. When meeting a person with a visual impairment, always identify yourself and others who may be with you. When conversing in a group, remember to identify the person to whom you are speaking.
4. If you offer assistance, wait until the offer is accepted. Then listen to or ask for instructions.
5. Treat adults as adults. Address people who have disabilities by their first names only when extending that same familiarity to all others present. Never patronize people who use wheelchairs by patting them on the head or shoulder.
6. Leaning or hanging on a person's wheelchair is similar to leaning or hanging on a person and is generally considered annoying. The chair is part of the personal body space of the person who uses it.
7. Listen attentively when you're talking with a person who has difficulty speaking. Be patient and wait for the person to finish, rather than correcting or speaking for the person. If necessary, ask short questions that require short answers, a nod, or a shake of the head. Never pretend to understand if you are having difficulty doing so. Instead, repeat what you have understood and allow the person to respond. The response will clue you in and guide your understanding.
8. When speaking with a person in a wheelchair or a person who uses crutches, place yourself at eye level in front of the person to facilitate the conversation.
9. To get the attention of a person who is hard of hearing, tap the person on the shoulder or wave your hand. Look directly at the person and speak clearly, slowly and expressively to establish if the person can read your lips. Not all people with a hearing loss can lip-read. For those who do lip-read, be sensitive to their needs by placing yourself facing the light source and keeping hands, cigarettes and food away from your mouth when speaking.
10. Relax. Don't be embarrassed if you happen to use accepted, common expressions that seem to relate to the person's disability, such as "see you later" or "did you hear about this?"

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Section 2: Adapting Environmental Education Activities for Students With Disabilities

- General Guidelines
- Adapting Activities for Inclusive Settings
- Factors to Consider When Adapting Activities
- Field-tested Suggestions for Adapting Activities for Inclusive Groups
- Project Ohio Outdoor Access: Design, Activities, and Participants
- Information about Project Learning Tree, Project WET, and Project WILD

"I think that by including special needs students with regular education students, you break down that fear barrier, and that unknown barrier that people take with them into adulthood. The other class begins to see our kids as being real people, that they're not to be feared, that they may not function in the same ways they do, but that's OK."

Sandy Walton, Teaching Assistant,
teaches students with multiple disabilities

General Guidelines

Sometimes when educators adapt activities to fit their lesson plans, or to meet the needs of their students, the objective of the original activity gets “lost” in the process. When field-testing the activities in this resource guide, we asked the teachers to abide by the following specifications:

- Adhere to the *original objectives* of each activity as specified by the publisher.
- Try to conduct the activity as originally written as much as possible.
- Attempt to conduct each step in the activity—do not leave a step out. If it was “impossible” to adapt a particular step, the teachers were asked to record what they tried and why it didn’t work.

Our teachers were directed to follow each step in the activity in order to focus on how to take already existing materials and adapt them. We realize that in the “real world” you may not always want to or need to conduct every step of an activity. Just remember that you are making modifications in order to make the activity accessible to your students, *not* modifying the objectives of the activity.

Adapting Activities for Inclusive Settings

When adapting activities for inclusive settings remember that each individual is unique. We can generalize but always remember that no two people are exactly alike. It’s important for educators to recognize each individual’s unique needs. When conducting activities be aware of safety considerations. All students should be aware of environmental factors and specific modifications. In general:

Prepare participants without disabilities by giving them:

- General information about disability issues.
- Specific information related to the needs of participants with disabilities.
- The opportunity to role-play—have all students “try out” the disability.
- Guidelines—discuss role of all participants, those with and without disabilities, to increase participation of all.

Include participants with and without disabilities in decision-making process regarding adaptations, rules, and other changes:

- The participant with a disability knows his or her abilities better than anyone.

- Non-disabled peers feel included by helping to make decisions about modifications.
- Activities may be more successful because all participants were involved in initial adaptation decisions.



Factors to Consider When Adapting Activities

When approaching the idea of adapting activities, it is helpful to identify the factors that you need to consider to enable students to participate as much as possible in each activity. The teachers in our project used the worksheet on pages 12 and 13 to record the modifications they implemented. The form is designed to help you prepare for an environmental education activity that includes students with and without disabilities. The worksheet is intended to help facilitate a process of evaluating the abilities and needs of students in relation to an activity or specific lesson plan. There are nine main factors that need to be considered when adapting activities. The following list provides a description for each factor.

Ability Levels and Functional Impairments

What needs to be considered when planning this activity for your class? A student may have more than one functional impairment, and an impairment may refer to more than one type of disability. For example, a person

with cerebral palsy and a person with a brain injury may both have difficulty with balance. There are 14 major areas of functional impairments. These include:

- **Activities of Daily Living:** The normal day-to-day activities that everyone needs to do to function including eating, dressing, toileting, and personal hygiene.
- **Balance:** The ability to hold oneself upright while walking, standing, sitting, or moving around.
- **Circulation:** The body's ability to maintain the needed blood flow for optimum physical condition.
- **Sensation:** The ability to detect through the sense of touch what is or is not touching or affecting the body in some way.
- **Motor Control:** The ability to use muscles.
- **Fatigue:** The ability to maintain the energy level necessary to perform the daily routine of life.
- **Diet:** The body's needs with regard to the intake of nourishment in order to maintain a healthy physical condition.
- **Judgment:** The ability to make judgments on personal matters regarding behavior and choices.
- **Memory:** The ability to retain and recall pertinent information when needed.
- **Reasoning:** The ability to think critically, comprehend information, and problem-solve.
- **Communication/Language:** The ability to communicate and comprehend information.
- **Behavior:** The ability to behave and express emotions appropriately for the situation.
- **Hearing:** The ability to hear sounds necessary to function in everyday life. Impairment could include partial hearing loss.
- **Vision:** The ability to see what is necessary to function in everyday life. Impairment could include partial vision loss.

Presentation Methods

What changes did you have to make in presenting this activity, e.g., visual, auditory, or tactile. For example, if you're planning to collect leaves, show examples of real leaves, in addition to talking about the leaves. Allow students, especially those with visual impairments, to touch and feel the leaves to compare characteristics.

Lead-up Activities

What activities would be useful to do before presenting this activity? For example, before making a bark rubbing outside, have students practice how to hold the crayons and paper by having them make a rubbing of a textured object such as a coin or leaf.

Physical Environment

What changes need to be made for conducting this activity? Is a more accessible site needed? What type of changes need to be made within the existing site? For example, the setting may need to be altered to accommodate wheelchair users, or students who have trouble walking and participants with balance problems. For these students try to find an area that is flat and smooth, as opposed to hilly and bumpy.

Material Adaptations

What changes are needed for the materials used in this activity? For example, use items that are easier to hold or pick up—poker chips are easier for students with limited fine motor skills to pick up than pieces of paper.

Procedural/Rule Adaptations

What procedures need to be changed when conducting this activity? For example, when collecting data and recording observations, instead of having students write and record individually, have them make observations orally and record as a group so that being able to write is not necessary in order to contribute and participate.

Break Activity into Tasks

How will you organize this activity to allow enough time for completion and comprehension? For example, if the activity usually consists of three steps completed within 50 minutes, pick one or two of the steps to conduct during this time; complete the remaining step during another time block.

Evaluating the Activity

What changes will you make to the assessment/evaluation strategies listed for the activity by the publishers? For example, evaluation may focus on whether students were able to follow rules and directions and whether students were actively engaged in the activity.

Extensions

What follow-up activities will you use for this activity and how did you make the extension accessible for all participants?

This information and the following worksheet were adapted and reprinted with permission from Celebrate the Earth: An Environmental Education Curriculum for People with Varying Abilities, 1993. Vinland Center, Loretto, Minnesota; developed in conjunction with Wilderness Inquiry. For more information contact the Vinland Center, Box 308, Loretto, MN 55357; 612-479-3555.

Factors to Consider When Adapting Activities Worksheet

Activity: _____ Form Completed By: _____

Dates Conducted: _____ Place Conducted: _____
(in classroom, in hallway, outside playground, etc.)

Ability Levels and Functional Impairments (What needs to be considered when planning this activity for your class? Enter each student's name on the appropriate lines below.)

Activities of Daily Living _____

Balance _____

Circulation _____

Sensation _____

Motor Control _____

Fatigue _____

Diet _____

Judgment _____

Memory _____

Reasoning _____

Communication/Language _____

Behavior _____

Hearing _____

Vision _____

Other _____

Presentation Methods (What changes did you have to make in presenting this activity, e.g., visual, auditory, or tactile?)

Lead-up Activities (What activities would be useful to do before presenting this activity?)

Physical Environment (What changes need to be made for conducting this activity? Is a more accessible site needed?)

Material Adaptations (What changes are needed for the materials used in this activity?)

Procedural/Rule Adaptations (What procedures need to be changed when conducting this activity?)

Break Activity into Tasks (How will you organize this activity to allow time for completion and comprehension?)

Evaluating the Activity (What changes will you make to the assessment/evaluation strategies suggested by the publishers?)

Extensions (What follow-up activities will you use for this activity and how did you make the extension accessible for all participants?)

Other Comments (Make note of any problems that you had when adapting this activity)

Field-tested Suggestions for Adapting Activities for Inclusive Groups

When adapting activities consider the participants' needs, the physical environment, and the program/activity requirements including evaluation. In general, adapt and modify only when necessary. The following suggestions are based on data collected during the field-testing phase of Project Ohio Outdoor Access. These ideas are meant to be used as a guideline when adapting environmental education activities to use with K-12 students with various physical, developmental, and behavioral disabilities. Feel free to use these suggestions and adapt them to *your* needs.

Presentation Methods (What changes do you need to make in presenting this activity, e.g., visual, auditory, or tactile?)

- Model as much as possible by showing visually what students should do, in addition to explaining orally. Concepts may need to be modeled. For example, as part of a predator/prey activity, the prey would move closer for each round of the game. The concept of “moving closer” should be modeled before the activity begins.
- If collecting leaves, show examples of real leaves, in addition to talking about the leaves. Allow students, especially those with visual impairments, to touch and feel the leaves to compare characteristics.
- Use peers to assist each other—pair lower functioning students with higher functioning peers; non-readers with readers; non-writers with writers, etc.
- Repeat directions/rules often—repetition is important for students with developmental disabilities.
- Use a hands-on, sensory approach.
- Include objects or actual items for tactile effectiveness.
- Use sound when possible. For example, if conducting an activity about water, play a tape of rain, thunderstorms, and river sounds.
- Incorporate sign-language (if possible) for students who are deaf.
- Brainstorm to generate group discussions—good for auditory learners.
- Use prompting questions to help students focus on the activity.
- Have participants sit (or stand) in a circle to help facilitate whole-group discussion.

Lead-up Activities (What activities would be useful to do before presenting the main lesson?)

- Conduct lead-up activities that relate to the concept or to the rules of the main activity. This can include reading stories/books, discussing rules for being outside, practicing how to collect objects, etc.
- For example, before going outside to make a bark rubbing, have the children practice how to hold the crayons and paper by making a rubbing of a textured object such as a coin or leaf. Assist by physically manipulating their hands through the motion, if necessary.
- When conducting art projects, model how to cut neatly, how much glue to use, how to color neatly.
- Show the students pictures of animals or plants they may see during the activity.
- Show a video to get ready for the activity.
- When working with more than one group of students, conduct “getting acquainted” activities to promote positive group interaction.

Physical Environment (What changes need to be made for conducting this activity? Is a more accessible site needed?)

- The setting may need to be altered to accommodate wheelchair users, or students who have trouble walking and participants with balance problems. Note: You can still conduct active games and maneuvers with students who use wheelchairs.
- Try to use terrain that is flat and smooth, as opposed to hilly and bumpy.
- Make sure space is large enough to accommodate a group of wheelchair users.

Material Adaptations (What changes are needed for the materials used in this activity?)

- Allow for variations in the types of objects used for students with poor fine motor skills. Use items that are easier to grab and hold. For example, poker chips are easier to pick up than pieces of paper.
- Make chart of new terms (vocabulary) for visual learners.
- In addition to using pictures of objects, have the actual objects available to touch, smell, see, hear.
- When using written directions in an activity, use words and pictures to accommodate non- or low-level readers.
- For projects that involve scissors, pre-cut patterns/shapes in advance.
- Use objects that can be picked up easily. Avoid those that lie flat; provide objects that can be easily handled.

Procedural/Rule Adaptations (What procedures need to be changed when conducting this activity?)

- Try to engage all students as actively as possible. Assign roles so that all are involved and everyone has something specific to do—be directive.
- When collecting data and recording observations, instead of having the participants write or record individually, have them make observations orally and record as a group onto one chart (good technique for non-writers, and students with limited fine motor skills).
- Allow more time for collecting, for hiding, for counting, etc.
- Have enough helpers around to assist students with ambulatory needs, such as pushing chairs, helping to walk, helping to see—can be peer helpers or adults.
- When manipulating objects, have the students work in pairs or small groups of mixed ability levels. One person can move the object while the others observe. Students who cannot move their arms or hands may be able to manipulate objects with their chins, or “point” with their eyes.
- Have students use a partner for recording information or use a tape recorder.
- Have students focus on describing textures instead of trying to name objects.
- Give simple directions.
- When collecting, set rules about objects to collect, such as no living animals.
- Use peers to assist with gathering; use word or picture cards and have students collect that exact item for matching.
- Alter time—increase time limits for each round of an activity.
- Use partners with students who are visually impaired.
- For active games, assign roles to “equalize” participation, i.e. students who can run have to hop; blindfold the quick students; no one can move faster than a walking pace.
- Set ground rules for safety. Make sure students understand safety precautions.
- Limit the amount of new vocabulary and terminology to key concepts. For example, if the activity focuses on the parts of a tree, you may want to concentrate on “bark” “roots” and “leaves” and their importance.

Break Activity into Tasks (How will you organize this activity to allow enough time for completion and comprehension?)

- Take your time conducting an activity—use specific blocks of time for each task. For example, if the activity usually consists of three steps conducted for 50 minutes, pick one or two of the steps to conduct during this time; complete the remaining step during another time block.
- Teach one concept at a time using a hands-on approach—short blocks of time work best (20–30 minutes) for each concept.
- Repeat and review often all previous steps.

Evaluating the Activity (What changes will you make to the assessment/evaluation strategies suggested by the publishers?)

- Rather than focusing on cognitive gains, evaluation may need to focus on the ability of participants to:
 - Complete a task.
 - Follow rules and directions.
 - Work together.
 - Socialize in an appropriate manner.
 - Be actively engaged in the activity.
- Discussion can be used to assess knowledge.
- If administering a formal test, read test questions to students with visual learning problems, or to students who are interested in being tested auditorily.

Extensions

What follow-up activities will you use for this activity, and how will you make the extension accessible for the participants?

- When planning follow-up activities, consider the adaptations discussed for presentation methods, the physical environment, materials, procedural and rule adaptations, breaking the activity into tasks, and evaluation.

Project Ohio Outdoor Access: Design, Activities, and Participants

The project focused on the processes used to adapt and modify already existing environmental education materials for use with students who have physical, developmental, and behavioral disabilities. Activities from Project Wild, Project Learning Tree, and Project WET were used and field-tested by the pilot groups.

The state coordinators from each program developed a combined Project Learning Tree, Project WET and Project WILD workshop for our pilot group teach-

ers; the workshop was held on September 7 and 8, 1995.

After attending the workshop, each group of teachers (elementary, middle, high school groups) met as a team to decide which lessons they would field-test. Teachers selected the activities based on their curriculum or interests. The only requirement was that they choose activities that were at least 30 minutes in length, as specified in the original activity. A majority of the activities selected were indoor-based activities. It's easy to look back now and say that we should have required each grade level to choose at least two outdoor activities. But it's just as important to acknowledge that environmental education can take place in *any* environment as long as students are in an environment that nurtures and encourages learning—a place where students can be actively involved in their learning. The project, including collecting information was organized as follows:

- Teachers attended the combined workshop on September 7 and 8, 1995.
- All teachers received release time to attend the workshop—all received materials for each program.
- Teachers selected activities by grade level.
- Each class field-tested three activities: one from each program.
- Each activity was field-tested by three different classes.
- Number of activities was limited in order to focus on the processes for adapting and modifying the activities (depth vs. breadth).
- Information about adapting the activities was recorded by the teachers on the worksheets.
- Follow-up interviews were conducted with the teachers and their teaching assistants.
- Group discussions with students were held to get their opinions about the activities.

The Activities Selected for This Resource Guide

Activities by Project

Project Learning Tree:

Looking at Leaves
Pass the Plants, Please
Dynamic Duos

Project WET:

Cold Cash in the Ice Box
A-maze-ing Water
Raining Cats and Dogs

Project WILD:

What's Wild
The Thicket Game
Wildwork

Activities by Grade Level

Elementary School:

Project Learning Tree: Looking at Leaves
Project WET: Cold Cash in the Ice Box
Project WILD: What's Wild

Middle School:

Project Learning Tree: Pass the Plants, Please
Project WET: A-maze-ing Water
Project WILD: The Thicket Game

High School:

Project Learning Tree: Dynamic Duos
Project WET: Raining Cats and Dogs
Project WILD: Wildwork

Project Participants Grade Level

- Elementary School: Two special education classes and one regular education class. The regular education class teamed-up with one of the special education classes to field-test the activities inclusively.
- Middle School: Two special education classes and one inclusive general science class.
- High School: Three special education classes.

Teachers

- Number of years teaching ranged from four years to over 20 years.
- The average number of years teaching was 12 years.
- All have degrees in special education except one.

Number of Teachers Involved in Project

- Teachers: 10
- Teaching Assistants: 5

Number of Students Involved in Project: 132 total

- Elementary School: 16 special education and 25 regular education students.
- Middle School: 19 special education and 32 inclusive science class students.
- High School: 41 special education students.

Types of Disabilities Represented by the Students in the Project

Most of the students had more than one of the following disabilities.

- severe developmental disabilities—low IQ
- non-verbal
- limited gross motor skills—walking and movement difficulties
- autism
- limited verbalization
- cerebral palsy—ambulatory and non-ambulatory
- visual impairments
- multiple sclerosis
- non-reader or limited reading skills
- seizure disorders
- problem following directions
- short attention span
- traumatic brain injury
- limited fine motor skills
- writing difficulties
- blind
- poor listening skills
- severe behavior problems
- spina bifida—ambulatory and non-ambulatory
- Down syndrome
- hearing impairments
- slow speech
- brain cancer—learning disabilities related to chemotherapy and medication
- poor balance
- paraplegia
- deaf
- hydrocephalic—shunts on both sides of brain
- muscular dystrophy
- quadriplegia
- hemiplegia—weakness on one side of the body

Information About Project Learning Tree, Project WET, and Project WILD

Since its introduction in the early 1970s, Project Learning Tree (PLT) has been recognized as one of the premier environmental education programs in the world. Through hands-on, interdisciplinary activities, PLT provides students with opportunities to investigate environmental issues and encourages them to make informed, responsible decisions. PLT uses the forest as a “window on the world” to increase students’ understanding of our complex environment; to

stimulate critical and creative thinking; to develop the ability to make informed decisions on environmental issues; and to instill the confidence and commitment to take responsible action on behalf of the environment. Project Learning Tree is a program of the American Forest Foundation and the Council for Environmental Education. For more information on participating in a PLT workshop and obtaining a copy of the Activity Guide contact: Project Learning Tree, 1111 19th Street NW, Suite 780, Washington, DC, 20036; 202-463-2462.

Project WET is a nonprofit water education program for educators and students in grades K-12. The goal of Project WET is to facilitate and promote awareness, appreciation, knowledge, and stewardship of water resources through the development and dissemination of classroom-ready teaching aids and through the establishment of state and internationally sponsored Project WET programs. Project WET is sponsored by The Watercourse and the Council for Environmental Education. For more information on participating in a Project WET workshop and obtaining a copy of the Curriculum and Activity Guide contact: Project WET, 201 Culbertson Hall, Montana State University, Bozeman, Montana, 50717-0057; 406-994-5392.

Project WILD is an interdisciplinary, supplemental conservation and environmental education program emphasizing wildlife. The goal of Project WILD is to assist learners of any age in developing awareness, knowledge, skills and commitment to result in informed decisions, responsible behavior and constructive actions concerning wildlife and the environment upon which all life depends. The Project WILD Aquatic Education Activity Guide is also part of the Project WILD program and emphasizes aquatic wildlife and ecosystems. Project WILD is a joint project of the Western Association of Fish and Wildlife Agencies and the Council for Environmental Education. For more information on participating in a Project WILD workshop and obtaining a copy of the Activity Guide contact: Project WILD, 5430 Grosvenor Lane, Bethesda, Maryland, 20814; 301-493-5447.

Information about Project Learning Tree is from the Project Learning Tree Environmental Education Pre K-8 Activity Guide, second edition, 1994 (pp. iv and vi). Information about Project WET is from the Project WET Curriculum & Activity Guide 1995 (p. i). Information about Project WILD is from the Project WILD K-12 Activity Guide, 1992 (p. vi).

Section 3: The Classes and the Activities

- **How to Use This Section**

- **Elementary School Level**

- Teacher and class descriptions
- Why these activities were selected
- Looking At Leaves (original activity)
- Looking At Leaves adaptation
- Cold Cash in the Ice Box (original activity)
- Cold Cash in the Ice Box adaptation
- What's Wild (original activity)
- What's Wild adaptation
- Other considerations

- **Middle School Level**

- Teacher and class descriptions
- Why these activities were selected
- Pass the Plants, Please (original activity)
- Pass the Plants, Please adaptation
- A-maze-ing Water (original activity)
- A-maze-ing Water adaptation
- The Thicket Game (original activity)
- The Thicket Game adaptation
- Other considerations

- **High School Level**

- Teacher and class descriptions
- Why these activities were selected
- Dynamic Duos (original activity)
- Dynamic Duos adaptation
- Raining Cats and Dogs (original activity)
- Raining Cats and Dogs adaptation
- Wildwork (original activity)
- Wildwork adaptation
- Other considerations

"It was fun doing them. Some of us, if not all of us, learned something new."

Student in Dora d'Amato's high school class

How to Use This Section

Section 3 is divided into three main parts by grade level: elementary, middle, and high school. Each part begins with a description of the teachers and their classes and includes a synopsis of the students' disabilities in each class. These descriptions are followed by an overview that outlines why the teachers selected these activities. After this overview, each activity is reprinted in its original format and is followed by the adaptations used by the teachers and their students in the project. **Please note:** Disregard the pages referred to in the original activity. They correspond to the actual Project Learning Tree, Project WET, or Project WILD activity guide.

We suggest that you begin using this section by reading the teacher/class descriptions and overview of why the activities were selected *before* you read the activities. In addition, it will be helpful for you to read the original activity first, and then the adaptations. This way, you will be able to determine what aspects of the activity needed modification. You'll find that for some classes the activities needed few changes, while other classes needed considerable adaptations to the presentation methods or to the tasks required for conducting the activity.

Each adaptation is presented in terms of the major factors to consider when adapting and modifying activities that were discussed in Section 2. These factors include: presentation methods, lead-up activities, physical environment, material adaptations, procedural/rule adaptations, break activity into tasks, evaluating the activity, and extensions.

The adaptations in this resource guide show the process our teachers used to adapt activities *and* provide a model that other educators can use when approaching the task of activity modification. One common adaptation was the need for more time to conduct the activity. In some instances, the teachers conducted an activity over a two-week span—a great difference from the time considerations proposed by the original activity. The teachers also needed to include more lead-up activities prior to conducting the main lesson.

After all the activities are presented (original and modified versions), each grade level concludes with Other Considerations, a "conversation" with the teachers and their assistants. This dialogue offers a candid view about how the teachers felt about conducting the activities, their ideas for inclusion, and how these activities related to their curriculum goals. While most of the teachers were very positive about the project and continuing their involvement in environmental education, a couple of teachers did voice their concerns about the feasibility of continuing to use these activities with their students. Their comments acknowledge the reality that it's not always easy to conduct or adapt activities that meet all students' needs.



Elementary School Teachers



Beth Stombaugh, Georgian Heights Alternative Elementary

Teaches students with developmental disabilities

Kathy Gordon, Whittier Elementary

Teaches students with multiple disabilities

Natalie Hetrick, Whittier Elementary

Teaches fourth grade regular education students



Beth Stombaugh's Class

Beth teaches students with developmental disabilities at Georgian Heights Alternative Elementary School which is part of the Columbus (Ohio) Public School system. Georgian Heights is a science, mathematics, and environmental science alternative school. Located on the west side of the city, the school is in an urban setting near low- to middle-income residential neighborhoods. Beth is in her mid-20's and has been teaching for four years. She has a bachelor's degree in special education with a specialization in teaching students with developmental disabilities and she is also certified to teach students with learning disabilities. Beth has spina bifida and uses a wheelchair.

Beth has 12 students in her class: six girls and six boys.* The students' ages and grade levels span several grades from first to fourth grade; ages 7 to 10 years old. All of the students are identified as developmentally disabled: their IQ scores are lower than 70 (an IQ score of 100 is considered the norm). Students have low social skills, low adaptive behavior skills, and all have difficulty reading. The three 9- and 10-year olds, Latisha, Susan, and Bobby read on a second grade level; the other students read on a pre-primary (letter recognition), kindergarten or first grade level. Several of the students have trouble following directions and paying attention. Robin tends to be in her own world; Scott often daydreams, and Michelle tends to give in to her temper tantrums. Fine and gross motor skill problems are experienced by several of her students too. Beth's students stay with her during the school day. However, they are in inclusive settings with other students for art, physical education, music, lunch, recess, and DARE. Two students receive speech therapy provided by the school district.

Kathy Gordon's and Natalie Hetrick's Classes

Kathy teaches students with multiple disabilities at Whittier Elementary School in Westerville, OH, a Columbus suburb. The school is located in a suburban area. Kathy is in her early 40's and has been teach-

ing for 17 years, solely in special education. She holds bachelor's and master's degrees in special education. Assisting Kathy on a daily basis are teaching assistants Sandy Walton and Val Ferretti. Sandy is in her early 40's and has worked as an assistant for six years with Kathy. Val is in her mid-30's and has been an assistant for one year; she is currently working on a special education degree.

Kathy has four students: three boys and one girl ages 9 to 12.* Developmentally the students are at the kindergarten and first grade level. All have severe developmental delays, low IQ's, poor cognitive skills, very delayed or impaired communication and language abilities, and little or no reasoning ability. Trisha is severely developmentally delayed, is essentially non-verbal and has poor fine and gross motor skills. Steven is autistic, is moderately developmentally delayed, and has limited verbalization. Tommy is autistic, and moderately developmentally delayed. Joey has cerebral palsy, is visually impaired, severely developmentally delayed, and has a seizure disorder. In terms of reading skills, Tommy is at the kindergarten/early first grade reading level and can read some simple sentences and some individual words; the others cannot read. Tommy can also print a little bit—he can print some words, can write his name, but he does not write to communicate. All of Kathy's students receive speech therapy, and occupational therapy on a regular basis at school. Three students also receive physical therapy. Speech, occupational, and physical therapies are made available by the school district. In addition to these services, one student also receives music therapy services that are arranged privately by the parents.

Kathy teamed up with Natalie's regular education 4th grade class to conduct these activities in an inclusive setting. Natalie has 25 students in her class. Natalie is in her late 30's and has been teaching for 15 years at the middle school and elementary school levels. She has a bachelor's degree in elementary education and a master's degree in curriculum and instruction.

For each activity, Kathy's students were either paired with a peer from Natalie's class, or the students worked in small groups: one of Kathy's students would be in a group with four or five of Natalie's students.

In addition, both teachers prepared Natalie's students about the needs of Kathy's students *before* conducting the activities inclusively. Kathy discussed the needs of her students with Natalie's class and talked about doing the activities together. Natalie invited Kathy's students into her classroom at different times to interact. Both classes have the same recess time and Natalie encouraged her students to buddy-up and play with Kathy's students, or walk with them. The classes did other activities together before conducting the environmental education activities. This pre-

liminary work was necessary to ensure that teaming up the classes would be a positive learning experience for all students.

The indoor activities were conducted in Natalie's room, and both teachers spent time setting up the classroom, making sure the desks were arranged so there weren't any physical limitations when Kathy's students came into the room. Natalie spoke to her students ahead of time reminding them that they need to listen during activities. She also made name tags for her students so that Kathy would know who they were—this worked well especially when they were in groups.

**All student names have been changed to maintain confidentiality.*

"It felt good. Instead of someone helping me, I was helping someone else."

**Student in Natalie Hetrick's class discussing
working with Kathy Gordon's students**

Activities Field-Tested With the Elementary School Students

Looking at Leaves (Project Learning Tree)

Cold Cash in the Icebox (Project WET)

What's Wild (Project WILD)

Why were these activities selected?

Looking at Leaves

- The activity related to the curriculum of the changing seasons.
- Students were able to practice skills such as following directions, using describing words, and classifying leaves by different characteristics.
- Leaves, trees, and their different textures were functional “real life” objects for sensory learning and were readily available.
- The activity lent itself well to doing expressive vocabulary building.
- The activity and extensions focused on using fine motor skills, a skill that many students need to improve.

Cold Cash in the Icebox

- The activity emphasized observation.
- It was a sensory activity.
- Students were able to practice using ordinal numbers (1st, 2nd, 3rd) and chart their observations.
- Making ice cream as an extension to the activity offered mobility for students—they could really participate and they could see and taste the results of their work.
- The activity related to a unit on Solids, Liquids, Gases being conducted at the same time.

What's Wild

- The activity related to the curriculum: students were reading about Ohio wildlife as part of a school-wide project.
- Students could practice their classification skills.
- This activity was directly related to prior learning and experiences, such as a recent class trip to the zoo.

64 LOOKING AT LEAVES



LEVELS

Activity: Grades K-4
Enrichment: Grades PreK-8

SUBJECTS

Science, Visual Arts

CONCEPTS

- Populations of organisms exhibit variations in size and structure as a result of their adaptation to their habitats. (10.1)
- Biological diversity results from the interaction of living and non-living environmental components such as air, water, climate, and geologic features. (1.1)

SKILLS

Comparing and Contrasting, Classifying and Categorizing, Identifying Attributes and Components

OBJECTIVES

Students will Ⓐ describe how leaf shapes, sizes, and other characteristics vary from tree to tree and Ⓐ explain how particular types of trees can be identified by their leaves.

MATERIALS

Tree leaves, pencils, leaf print supplies for "Enrichment" (Types will vary depending on print method used; see various "Enrichment" activities.), copies of student page 231 (for assessment)

TIME CONSIDERATIONS

Preparation: 20 minutes

Activity: 50 minutes

Overview

Are leaves ever hairy? Do they have teeth? In this activity, your students will take a closer look at leaves and find out more about leaf characteristics and how leaves can be used to identify trees.

Background

See Background for "Name that Tree" on page 244.

Getting Ready

Locate an area where the students can collect leaves (from the ground, if possible) from several different kinds of trees. You may want to collect a sample, including needles from coniferous trees. In temperate climates, this activity is easiest to do in the fall.

Doing the Activity

1. Take students outside. Have them collect two or three different kinds of tree leaves, and encourage them to pick leaves that have already fallen to the ground. Be sure to collect needles in the clusters in which they grow.

2. When back inside, have students examine their leaves.

- What are the differences between the leaves?
- What do the leaves have in common?
- Do any leaves have teeth?
- Do any have hairs?
- What do the leaves feel like?
- Who found the biggest leaf? the narrowest leaf? the smallest leaf?
- Have any leaves been eaten by insects? How can they tell?
- Can they trace the veins on their leaves with their fingers?

If no one collected needles, pass out some that you collected earlier or show them a picture of needles. Have students compare the needles to the other leaves.

3. Have students give one of their leaves to another student. Explain that they will go outside to find what kind

of tree that leaf came from. How will they know when they've found the right tree? (It will have the same kind of leaves.)

4. Take students back to the same trees where they gathered leaves in Step 1. Walk from tree to tree, and have students compare their leaves with leaves on the tree. If one or more students has a leaf that matches a tree, stop and examine the tree more closely.

- Where on the branch do leaves grow?
- How are they attached?
- Do the leaves grow far apart from each other, close together, or in clumps?
- If the leaves are needle-like, how many needles are in each cluster?
- Are all the clusters the same? Are all the needles in the cluster the same length?
- Do all leaves on the tree match exactly?
- What color are the leaves?
- Also examine other characteristics of the tree. For example, what is the bark of the tree like?
- What color is the bark?
- Are flowers, nuts, or fruit on the tree? What do they look like?

5. Continue looking at trees until all students have identified the tree that their leaf came from. As they examine each tree, be sure to ask questions to make students compare trees that they've looked at. For example, ask:

- Are this tree's leaves larger or smaller than the last tree's leaves?

- This tree's leaves grow in a clump. Have we looked at any other trees that have leaves which grow in a clump?
- What's similar or different about these two trees?

Enrichment—Leaf Art

Have students use the leaves they collected in Step 1 of "Doing the Activity" to create their own prints. Here are four "leafy" ideas for you to try, depending on the age of your students and the amount of time available.

Leaf Crayon Rubbings

Materials

Dark-colored crayons, plain drawing paper

Directions

Set the leaf on a smooth surface, preferably vein-side up; then cover it with a plain piece of paper. Rub a crayon sideways back and forth across the paper above the leaf. The margin of the leaf as well as its veins should begin to show on the paper as you rub gently.

Spatter Prints

Materials

9" x 12" (23 cm - 30 cm) wire, plastic, or nylon net screen; toothbrush; straight pins; tempera paint; paper

Directions

Place a leaf on a sheet of paper and secure it with pins. Then place the screen over the leaf and paint across the screen using a toothbrush. Afterward, lift off the screen, unpin the leaf, and carefully lift the leaf away.

Pressed Leaves

Materials

Iron, towel, wax paper

Directions

Place a leaf between two layers of wax paper and then cover with a towel. Press the towel with a warm iron, being sure to iron over the entire area of wax paper. (This will seal the leaf between the two layers of wax paper.) Afterward, you can cut out each leaf, leaving a narrow margin of wax paper around the entire edge of the leaf. Then you can punch holes through

the wax paper at the top margin of the leaf and hang the pressed leaf. Use several leaves to make a hanging leaf mobile.

Leaf Print T-Shirts

Materials

Clean, poly-cotton-blend T-shirt; acrylic paints; paintbrush; piece of cardboard; wax paper; paper towels

Directions

Place the shirt on a clean, flat surface; then slide the cardboard between the front and back of the shirt to keep paint from soaking through. Place a leaf on a sheet of wax paper and coat it with a thin layer of paint. Make sure your fingers are clean; then carefully lift the painted leaf up and place it (painted side down) on the shirt. Cover the leaf with a paper towel and press it down. Lift the leaf straight off the shirt. Make as many more leaf prints on the shirt as you would like; then hang the shirt to dry.

NOTE—Do not use fabric softeners to clean or dry your shirt before you start printing. Also, to help make the prints last longer, rinse the finished shirt in a mild water and vinegar solution before washing it for the first time.

Cherokee Leaf Printing

Materials

A medium-sized, flat-headed hammer (a flat rock will also work); masking tape; a large, flat board; a supply of newspapers; wax paper; pieces of white cloth or clothing to print on (100% cotton or unbleached muslin works best); leaves from marigolds, tulip poplars, red or white oaks; carrot tops; strawberries.

Directions

The idea is to transfer the natural dyes from a leaf to a fabric, while retaining the design of the original leaf. Do this by beating the leaf's chlorophyll directly into the cloth, which will set the dye through natural chemical action. Use this technique to decorate any natural cloth surface such as table cloths, curtains, wall hangings, T-shirts, handkerchiefs, and headbands. Lay several thicknesses of newspaper on a flat board. Spread your cloth, right side up, on top of the newspaper. Put leaves on the cloth in a pattern of

your choice. Place wax paper over the leaves and tape it around the edges. Use a hammer to pound the leaf until the color transfers to the cloth. Pound evenly for a good print. If the leaf does not print evenly, crumple up another leaf, dip it water, and use it to "paint" the unstained spots. The dyes from the leaves must be set into the fabric to resist fading. This process also affects the color. For bright colors, soak the fabric in a solution of 3 tablespoons (44 ml) of ferrous sulfate per gallon (3.8 liter) of water for 1-2 minutes (or use the same solution of alum for a less-brilliant color set). For rich, reddish-brown hues, use a solution of 1 cup (240 ml) wood ashes to 3 gallons (11.3 l) of cold water for 5 minutes. Rinse the fabric in clean water, and air dry it away from direct sunlight. To help retain the natural colors, you can soak the finished piece in 1/2 cup (120 ml) of salt to 2 gallons (7.5 l) of water for 10 minutes [or in a solution of 3 tablespoons (44 ml) of baking soda to 1 gallon (3.8 l) of water]. Rinse and dry as directed above.

Leaf Batik

Materials:

100% cotton cloth squares, pencils or pens, yellow and/or orange fabric dye, red and/or brown dye, household paraffin, hot plate, heavy saucepan, metal spoons, natural bristle paintbrushes, large glass or metal bowls, clothesline and clothespin, leaves for tracing patterns, newspaper, glass cups or dishes for melted paraffin, iron, rubber gloves for students and adults.

Directions

Trace a leaf pattern onto a cloth square with pencil or pen. Using yellow and/or orange dyes only, dip each square in dye. Hang squares on the clothesline to dry. After they have dried, "paint" the leaf shape on the cloth with melted paraffin, filling in the outline of the leaf you have traced. Constantly reheat the paraffin; if it is not sufficiently heated, it will turn white (cool) immediately after being painted onto the fabric and will not protect the fibers from receiving the final dye color. Ask students what they think will happen when they dip the cloth into the next colors of dye. (The dye will affect only those areas

not covered by the paraffin.) Crumple the prepared cloth, then dip it into the red and/or brown dye(s). Hang the cloth on the clothesline to dry. When it is dry, iron the cloth between layers of newspaper. Change the paper when it becomes saturated with paraffin. When no more paraffin melts onto the paper, the batik is finished. You might display the finished squares of cloth as a quilt.

END NOTES...

ASSESSMENT OPPORTUNITY

Pass out a copy of page 231 to all students, and tell them that they have to identify which tree each leaf on the right side of the page came from. Explain that they should use the tree drawings on the left side of the page to make identifications. As they identify the leaves, have students draw a line from leaf to tree and then copy the tree name onto the line next to the leaf. Afterward, have students explain how they identified each leaf.

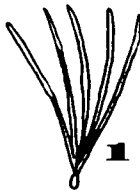
RELATED ACTIVITIES

Name That Tree; The Closer You Look; Bursting Buds; The Shape of Things; Adopt a Tree

A LOOK AT LEAVES



SASSAFRAS



1



SWEET GUM



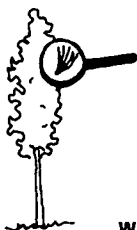
2



PIN OAK



3



WHITE PINE



4



COTTONWOOD



5

Looking At Leaves

Beth Stombaugh's class

Students with developmental disabilities
Lead-up Activities conducted Oct. 30–Nov. 2
Main Activity and Extensions conducted
Nov. 3, 6, 10
Location: Outside and in classroom

Kathy Gordon's and Natalie Hetrick's classes

Students with multiple disabilities; regular
education students
Lead-up Activities conducted during month
prior to the main activity
Main Activity and Extensions conducted
Oct. 27, 30
Location: Outside and in classroom

Adaptations and Modifications Implemented for Each Factor

Presentation Methods

Kathy and Natalie used actual leaves with different shapes and sizes to show the students that they should look for a variety of leaves. Kathy also created a large chart for categorizing the leaves.

No changes were needed for Beth's class.

Lead-up Activities

Beth read books about leaves with her class: *The Seasons of Arnold's Apple Tree* by Gail Gibbons (1984); *Red Leaf, Yellow Leaf* by Lois Ehlert (1991). She read these books over four days for about 20 minutes each day. Before going outside, Beth discussed rules for being outdoors: keep hands to yourself, walk instead of run, don't go far back into the woods, stay where she could see them.

Kathy conducted a Fall Sensory Exploration activity earlier in the month where her students were able to see, feel, smell, and listen to Fall items including leaves. She had also made a Fall bulletin board, with a tree and leaves, and the students had to put leaves on the tree. Students were involved in these activities for about two hours.

Physical Environment

In Beth's classroom the students' desks were already arranged in a large U-shape. The furniture placement gives Beth enough room to maneuver in her wheelchair and work with students one-on-one at their desks when needed. No changes were needed for the outdoor part of the activity.

Kathy and Natalie made sure that there weren't any physical limitations when Kathy's students came into the room. They rearranged desks and other furniture as needed. No changes were needed for the outdoor part of the activity.

Material Adaptations

Beth had each student collect about 10 leaves in bags instead of two or three leaves; she also brought in acorns for the class to look at.

Kathy's student with a visual impairment was led by a peer buddy or teacher assistant to help him actually touch and explore leaves. Kathy made a very large chart to sort the leaves by category which helped the students see and compare the leaves.

Procedural/Rule Adaptations

When going over the questions such as "do any leaves have teeth?" Beth had each student hold up a leaf they had with teeth so that all students were actively engaged. When going back outside to identify the tree where the leaf came from, some students had difficulty finding the specific tree. They needed some help and prompting questions to direct them such as "Are the leaves on the tree the same shape and size as the one you're holding." Beth used the student page worksheet "A Look at Leaves" *before* the class went back outside to identify the tree. The worksheet helped them to focus on the idea of matching the leaf to the correct tree.

After collecting the leaves, Kathy made a large chart and let the students choose the categories: large, small,

clusters, broad, needle-like leaves. Then the students taped their leaves to the correct category; each group had the chance to attach one or two of their leaves to the chart and had at least one leaf leftover to use for going back outside for the next part of the activity. The peers from Natalie's class helped Kathy's students choose the correct category. When the students went back outside to identify the tree where the leaf was from, Kathy had each group switch leaves so that the students weren't just automatically going back to their original trees. By doing this activity inclusively with a regular education 4th grade class, Kathy's students could work in a group where they would have partners to help pick out leaves and to help categorize.

Break Activity into Tasks

Beth conducted this activity over two days. When collecting the leaves, she put the students in pairs that consisted of one higher functioning and one lower functioning child. This way, students could help each other. She also reminded students every couple of minutes to collect different kinds of leaves, and not all the same kind.

The students collected leaves in the morning for about 15 to 20 minutes. In the afternoon the students sorted the leaves; discussed the characteristics; made leaf rubbings, and did the student page worksheet "A Look At Leaves"—these afternoon activities took about two hours to complete. On Day 2, Beth's class went back outside and identified a tree where one of their leaves came from; this component took about 20 minutes to complete.

Kathy's students went outside with Natalie's students to collect leaves. Kathy and Natalie divided them into groups, putting one of Kathy's students in each group; there were a total of four groups with six or seven students in each group. When outside, each group collected in a specific area around the school grounds, and picked leaves from the ground and not off the trees. Going outside and collecting two to three leaves per group took about 15 minutes. When they went back inside, Kathy made the chart and had the groups come up with their own categories for describing the leaves; she used prompting questions to help direct them. If they didn't mention a category that was suggested in the original lesson, she would ask them "what about leaves in clusters—

did anyone find that?" and similar questions. Kathy and Natalie let the students try to create their own categories, and then would question them about categories that they didn't think about, such as clusters, insect-eaten, etc. This part of the activity took about 20 minutes to complete. After categorizing their leaves, the students went back outside with their "new" leaves to identify the tree where the leaf came from (see Procedural/Rule Adaptations); the students remained in their groups for this segment which took about 15 minutes to conduct. The teachers conducted this activity on one day, including the leaf-rubbing extension art activity. Another extension activity, leaf silhouettes, was done on a different day.

Evaluating the Activity

As stated under Procedural/Rule Adaptations, Beth used the "A Look at Leaves" worksheet before going outside. The worksheet helped her students focus on the idea of matching a leaf to its tree of origin. Individual one-on-one help was given to some students for the worksheet. Other evaluation methods included assessing whether the students were able to identify different leaf characteristics, and use the appropriate words to describe the leaves.

Kathy did not use the student page worksheet with her students, but Natalie did. Instead, Kathy's criteria for evaluation included assessing whether her students could tell her that the objects they collected were "leaves" and if they were able to be actively involved in the activity with their peers. She focused on the students identifying vocabulary related to the activity: "leaf" "tree" "rough" and other leaf characteristics.



Beth and her students categorize their leaves.

Another suggestion that Kathy had for adapting the evaluation component of this activity included using a chart that allows the teacher to fill in the vocabulary she or he wants to enrich for students who are language-impaired. This way the teacher could focus on sensory words (*rough/smooth*) or on specific terms (*leaf/tree*) or leaf colors (*red/yellow/green*) or on words that describe the size of leaves (*big/little*). The teacher could put the vocabulary words on a chart and then would concentrate on identifying leaves that matched the describing word.

Extensions: Leaf Rubbings

For making leaf rubbings, Beth modeled how to hold the crayon and paper, and showed the students that they needed to peel the paper down the crayon before using. One-on-one help was given to several students, especially holding the paper while they did the rubbing. Students also helped hold the paper for each other. For several students with fine-motor-skill problems it was difficult to hold the paper and rub with the crayon at the same time. This extension was conducted for approximately 30 minutes.

Kathy conducted this activity with Natalie's students; Natalie's class had done leaf rubbings before, so they knew what to do. Two of Kathy's students, Steven and Tommy, paired-up with peers from Natalie's class. Her other two students needed extra assistance from either Kathy or one of her teaching assistants. Joey needed extra assistance to help pick out the crayon to make the rubbing. He only has use of one of his hands, and Kathy used a "hand-over-hand" technique to assist him with this activity: she held her hand over Joey's to make the leaf print. Joey's

visual skills are poor, and he needed help with guiding the crayon. Trisha also needed direct hand-over-hand assistance too. This extension was conducted for about 30 minutes.

Leaf silhouettes: Kathy's students did this activity by themselves, without Natalie's class. She had the students collect more leaves and tape them to a piece of paper with help from her or the teaching assistants. The students then sponge painted over the leaves. After the paint dried, the leaves were removed to reveal the leaf silhouette. The students enjoyed this and were able to do this activity pretty well. Joey and Trisha needed hand-over-hand help to apply the paint. This activity took approximately 30 minutes.

Other Comments

Beth: "There were no real problems with this activity."

Kathy: "Our students seemed to enjoy it—I think that they were motivated. I don't think they were cognitively realizing "oh we're going to collect leaves" but the sensory aspects, getting outside, being with the other kids and the interaction were great. Natalie's class was really motivated to interact with our kids and that provided a lot of positive interaction for our students. They were excited about being around the other kids in the other class."

Natalie: "Finding similarities, differences with the shapes, colors and so forth kept it simple, but it addressed all students' needs because a child could realize that if he did not know the particular leaf, he could still make a classification about the shape and size."

"I liked the leaf rubbing 'cause they changed colors."

Student in Beth Stombaugh's class

Cold Cash in the Icebox



■ **Grade Level:**
Lower Elementary, Upper Elementary

■ **Subject Areas:**
Physical Science, History, Mathematics

■ **Duration:**
Preparation time: 30 minutes
Activity time: 50 minutes

■ **Setting:** Classroom

■ **Skills:**
Applying (hypothesizing, predicting, experimenting, designing); Evaluating (analyzing, interpreting)

■ **Charting the Course**
In "Molecules in Motion" students learn how heat energy affects water molecules. In "Hangin' Together" students investigate how hydrogen bonding causes ice to be less dense than liquid water. The concept of density is explored in "Adventures in Density." A good follow-up activity is "Water Concentration."

■ **Vocabulary**
insulation, heat energy, hypothesis

"An exterior case of antique oak, ice and provision chambers, and a drip cup based on the latest and most appropriate scientific principles: all for \$22.73." Your grandparents' icebox bears little resemblance to the refrigerator in your kitchen today.

Summary

Students design mini-insulators (iceboxes) in an attempt to keep ice from melting and discover the challenges of refrigeration of 100 years ago.

Objectives

Students will:

- compare the insulating properties of various materials.

Materials

- Copies of *Stay Cool Chart*
- Pint-size (473 ml) milk carton (1 per student, plus one extra, rinsed, with both top flaps pulled open)
- A variety of materials for insulating ice (straw, hay, grass, 100% cotton cloth, sawdust or crushed cedar shavings, dirt, sand, dried beans; may be provided by teachers or brought from home by students)
- Ice cubes
- Measuring spoons or graduated cylinder

Making Connections

Almost every house has a refrigerator. Students may have parents or grandparents who once owned an icebox. By designing their own icebox, students can experience some of the challenges their ancestors faced while trying to preserve food.

Background

When temperatures reach the freezing point (32 degrees F [0°C]), water changes

from a liquid to a solid state. The water in lakes and rivers freezes on the surface, while water below remains a liquid. Throughout the winter, aquatic life survives under the ice. Ice is less dense than water. Ice floats on the surface of a body of water and acts as an insulating barrier, moderating the temperature of deeper water.

To keep ice frozen, air temperature must remain at or below the freezing point. Heat energy (movement of molecules) flows from areas of warm to cold (or high energy to low). If warm air (containing faster moving molecules) comes in contact with the slower moving molecules in ice, the energy will be transferred from the air to the ice. When the water molecules in ice move faster, the ice melts. Some materials do not transfer heat energy well. (The molecules in the materials are held together strongly and are less able to move around or to transfer heat energy.) These substances are called insulators. In the case of preserving ice, insulating material such as straw is used to keep heat energy away from ice.

Before the days of electricity, ice was harvested in the winter months from frozen lakes and streams and stored in icehouses to be used for refrigeration. People cut huge blocks of ice from thick, frozen layers, using special grooving plows that had sharp blades. While humans steered the plows, horses pulled them over the ice surface again and again, until the blades had made cuts deep enough to remove the ice blocks. Later, tractors and automobiles were used in place of horses to pull the plow.

The ice was stored in well-insulated icehouses where ice blocks were packed in sawdust or straw. Ice companies sold the ice blocks to homes, to businesses such as grocery stores for their coolers,

and to railroads for refrigeration cars.

Ice was sold by the pound or by the block. Blocks of ice were delivered to customers in an ice wagon or truck. The driver knew when customers wanted ice because an ice card would be displayed in one of the home's windows. The customer paid for the product with cash or with ice coupons. The iceman carried blocks of ice with tongs and wore a leather apron with pockets to collect the dripping water and chips. In the homes, the blocks were stored in the icebox or ice chest, which served as a refrigerator.

Ice was placed in the ice chamber of the icebox, where air passing over the block cooled and fell directly under the provisions chambers. Warmer air rose, contacted the ice block, and fell, thus maintaining a constant flow of air. Small pieces of ice were chipped off the large block with an ice pick, to be used to cool

drinks. Ice harvesting was a lucrative business before the delivery of electricity to urban and rural homes.

In 1833, a man in New England named Frederic Tudor, owner of a successful ice harvesting business, agreed to fulfill an ice order that was to become the first international shipment of ice from the United States. His company contracted to sail 180 tons (169 tonnes) of ice to Calcutta.

Tudor prepared his vessel with a special lining of extra lumber and further insulated with straw, hay, and sawdust. Then he carefully packed the straw, hay, and sawdust between each cord of ice that was brought onto the ship. For three summer months, he sailed with the first ice cargo to ever cross the equator. When he docked in Calcutta and inspected the cargo, he found that 100 tons (91 tonnes) of ice had remained frozen during the long, hot journey.

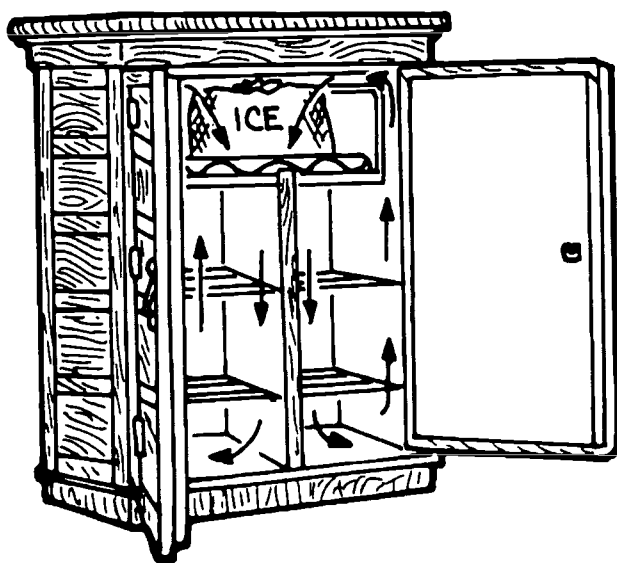
Procedure

▼ Warm Up

Ask students if they know how people kept their food cold before electric refrigerators were available. Where did people get ice? How long do students think an ice cube can last outside a freezer?

▼ The Activity

1. Explain to students how ice was once harvested from lakes and ponds, kept in icehouses, and used in iceboxes to keep food cold before electric refrigerators were available. Share with them the story about the first ice shipment to Calcutta.
2. Have students predict and record on the *Stay Cool Chart* those materials they believe would be good insulators.
3. Give each student or group a milk carton and an ice cube; let them choose the type of packing material they think will best preserve their ice. Students may bring materials from home or choose from items provided by the teacher.
4. Have them pack the ice, close and flatten the carton top, and write their name on the outside of the carton with a marking pen. On their *Stay Cool Chart*, students should draw a picture of how their ice is packed. In another milk carton, place an ice cube without packing (as a control), close the top, and write "no insulation" on the outside.
5. Place all iceboxes on a table, out of direct sunlight. Students check each box every two hours throughout the day, pouring out and measuring the amount of water that has collected in the box. Record measurements on the *Stay Cool Chart*.
6. Have them compare the preservation of ice in their icebox to the ice cube that is not insulated. An alternative to measuring is having



Old-fashioned icebox



students draw pictures of the two cubes, to indicate their change in size over time.

▼ *Wrap Up*

How long did the uninsulated ice remain frozen? Were any of the insulated ice cubes still frozen at the end of the day? Which type of insulating material worked best? Have students draw conclusions and make recommendations on the *Stay Cool Chart*. Have students summarize the importance of ice for refrigeration before the days of electricity.

Assessment

Have students:

- predict and test the insulating abilities of different materials (steps 2, 3 and 4).
- create a mini-icebox using insulating materials designed to delay an ice cube's melting (step 4).
- evaluate designs and make recommendations for improvement (*Wrap Up*).

Upon completing the activity, for further assessment have students:

- construct a time line showing how people in the past, present, and future preserve food.
- write a catalogue description to sell an icebox in the late 1800s.

Extensions

What happens to fish and aquatic life when rivers and lakes freeze over? Water below the surface of ice is kept at a relatively constant temperature because heat energy is continually being transferred between liquid molecules and is not allowed to escape (the layer of ice traps the heat). Have students investigate how water freezes from the top down. Put some rocks in the bottom of a bowl of water and place the bowl in the freezer. After a layer of ice has

formed, poke a hole and have students look at the rocks below the ice. They should check the temperature of the water. Could a fish survive in this temperature?

Ice-Cream Making.

Ice was used in many ways. It kept food cold in the icebox and it chilled drinks. In the summer, children would gather at the ice man's wagon, in the hope he would give them pieces of ice chipped from the big blocks. Ice was also used to make ice cream.

Students can make their own ice cream. Combine 1 cup (240 ml) milk, 2 tablespoons (30 ml) vanilla, 2 tablespoons (30 ml) sugar, and 2 tablespoons (30 ml) canned milk in an empty, clean 1 pound (.45 kg) coffee can. Tape the lid on the can and place in a 3 pound (1.35 kg) coffee can. Pack ice and rock salt in the space between the 1 pound (.45 kg) and 3 pound (1.35 kg) coffee can. Tape the lid on the 3 pound (1.35 kg) coffee can. Roll the coffee can back and forth for at least 15 minutes. Ice cream is ready when the liquid ingredients in the smaller can "sound" solid. Open the 1 pound (.45 kg) can and enjoy the ice cream.

What would happen if you changed some of the variables when making the ice cream? Students could test the following variations:

- Milk: amount, type (skim milk, 1% milk, 2% milk, whole milk, whipping cream, evaporated milk)



Students help an ice cube maintain its cool.

- Sugar: type, amount
- Flavorings: added before or after freezing, type, amount
- Ratio of salt to ice

Resources

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Kepler, Lynne. 1992. "Make Science Matter." *Instructor* (102) 4: 74-75.

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Stay Cool Chart

Name: _____ Date: _____

Hypothesis	Procedure	Results		Conclusions/ Recommendations
I think the following materials will insulate ice:	Draw a picture of how you packed the ice (label the materials used):	Test	Control	What worked? What would you do differently next time?
		Time: Amount of water:	Time: Amount of water:	
		Time: Amount of water:	Time: Amount of water:	
		Time: Amount of water:	Time: Amount of water:	
		Time: Amount of water:	Time: Amount of water:	
		Time: Amount of water:	Time: Amount of water:	

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Cold Cash in the Icebox

Beth Stombaugh's class

Students with developmental disabilities

Lead-up Activities conducted Nov. 17

Main Activity and Extensions conducted Nov. 17, 20

Location: Classroom and school kitchen

Kathy Gordon's and Natalie Hetrick's classes

Students with multiple disabilities;

regular education students

Lead-up Activities conducted Nov. 21

Main Activity and Extensions conducted Nov. 21, 22

Location: In classroom

Adaptations and Modifications Implemented for Each Factor

Presentation Methods

Beth's class looked at and felt a freezer compartment to show concrete examples of ice and how a freezer worked.

Kathy tried to increase understanding by bringing in an old icebox and a large block of ice for students to examine.

Lead-up Activities

Beth talked about iceboxes and showed students a picture of an icebox. She led class discussion using the "warm up" discussion questions.

Kathy brought in an old icebox to explain how people used to keep food cold, in addition to using the discussion questions from the activity. She also brought in a large block of ice to demonstrate the thawing process—her students could see the block melting and how it (the ice) melted down into water.

Physical Environment

In Beth's classroom the students' desks were already arranged in a large U-shape. The furniture placement gives Beth enough room to maneuver in her wheelchair and work with students one-on-one at their desks, particularly when measuring the water in the iceboxes, or helping students make the iceboxes.

Kathy and Natalie made sure that there weren't any physical limitations when Kathy's students came into the room. They rearranged desks and other furniture as needed.

Material Adaptations

Instead of having each student complete charts individually, Beth had her class make predictions orally, and they recorded their predictions as a whole class on chart paper. They used cotton, shavings, sand, salt, and dried beans.

Kathy brought in an icebox and a large ice block for lead-up discussion. The students used hay, cloth, dirt, sand, dried beans, split peas, Styrofoam packing peanuts, sawdust, and wool as insulating materials.

Procedural/Rule Adaptations

In Beth's class, each student made their own icebox and selected their own materials. Every two hours the students looked at their boxes, and measured the water with assistance from Beth—they helped her pour the water into a cylinder, and drew a picture of what they observed. They made a class chart and recorded what materials melted the ice cube the fastest; what material melted the ice 1st, 2nd, 3rd and so on. They compared their boxes to the control icebox. This activity was conducted throughout the day.

Kathy and Natalie's students made their iceboxes in small groups of three or four students: one icebox per group. The students also completed their charts as a group. Kathy's students were unable to make predictions, but they were able to participate in the process of making the iceboxes. The iceboxes were checked every hour.

Break Activity into Tasks

Beth's class conducted the icebox activity on one day, and made ice cream on a separate day (see Extensions). Making the iceboxes and filling them with insulating materials took about 30 minutes. The boxes were checked every two hours throughout the day. At the end of the day, making a class chart and recording their observations took about 20 minutes.

Kathy and Natalie's students began the activity early in the day by making the iceboxes and putting ice in them—approximately 40 minutes was needed for this part. When the students went back to check them, they used measuring spoons to measure the water. If they weren't able to do that, Kathy had them draw pictures of what the ice looked like compared to how it looked the first time. This process took about 5 to 10 minutes each time. They checked the iceboxes at 11 a.m., noon, and at 1 p.m.

Evaluating the Activity

Beth's students were able to complete all the steps in the activity. Most of the students were able to understand the term hypothesis, make predictions, and make sense of their predictions and the chart.

Kathy's students helped out with each group, but Natalie's students did all the recording on the charts. The students were able to complete all the steps in a small-group context.

Extensions

Beth's class made ice cream on a separate day. The ice cream making took approximately an hour. She

had each student put in specific ingredients, each child had a turn to roll the can: they made one batch for the class. Students measured the ingredients with assistance from Beth. Her class does a lot of cooking, so they're used to measuring ingredients.

Kathy's and Natalie's students made ice cream the next day in coffee cans. Students worked in small groups of three to four students. Students had a chance to measure one ingredient for each batch. Kathy's students added ice to the cans and rolled the cans back and forth to process the ice cream. Natalie set up another station in the room and helped tape the cans shut. The students compared the homemade ice cream to ice cream they made in an electric ice cream maker. The extension was conducted for approximately two hours.

Other Comments

Beth's class used this activity the following term as a project for the school science fair.

Kathy: "It was great for the kids to see what was involved in making the ice cream, how much time is involved. The sensory activities work the best for my students because the kids are at a sensory-motor level for learning."

Natalie: "When we did it [this activity] it was something that could include everyone, with rolling the cans and processing the ice cream and they were fascinated with what it turned out to be . . . they realized that no matter what level you're at in your academic growth and age everyone can be touched in some way by doing the activity."

"It was fun 'cause it [the ice] melted all by itself."

Student in Beth Stombaugh's class

WHAT'S WILD

OBJECTIVES

Students will: 1) distinguish between wildlife and domesticated animals; and 2) recognize that wildlife occurs in a variety of forms.

METHOD

Students find and classify pictures of wild and domesticated animals, and construct collages.

BACKGROUND

An animal is generally referred to as any living organism other than a plant. Wildlife is any animal that lives in a basically free condition, providing for its own food, shelter, and other needs in an environment that serves as a suitable habitat. Wildlife refers to animals that are not tamed or domesticated. Wildlife may be small organisms only visible to humans if seen through a microscope, or as large as a whale. Wildlife includes, but is not limited to, insects, spiders, birds, reptiles, fish, amphibians, and mammals, if non-domesticated. Domesticated animals are those which humans have tamed, kept in captivity, and bred for special purposes. The process of domestication takes place over a long period of time and has involved genetic manipulation through selective breeding. All domesticated animals have their origins in wild ancestors. Cattle used for food and other products; sheep for wool and other products, as well as dogs, cats, birds, and fish commonly kept as pets are all examples of domesticated animals.

Confusion can arise about animals that sometimes may

be wild, sometimes may be tamed, and sometimes may be domesticated. If the animal, or population of animals, can live on its own, survive, and even reproduce, it is probably wild. Individual animals may be tamed—like some animals in zoos—while most of their numbers remain wild. A wild animal may appear to be tame, but still should be considered wild unless it is both tamed and domesticated. Some animals that are usually considered domesticated—like dogs, cats, horses, and goats—may become wild. When they do, the term "feral" is used. For example, there are feral goats on Catalina Isle, and feral horses and burros in some areas of western states in the U.S.

Where it is difficult to distinguish whether an animal is wild or domesticated, encourage the students to think in terms of what is **usually** the case. Remember that wild animals basically take care of themselves, as long as they have a suitable environment or habitat in which to live. Domesticated or tamed animals basically depend on people to feed and take care of them, and are typically used by people; for example, as a source of products and as pets. Whereas domesticated animals like cats and dogs are normally considered suitable pets, wild animals—even if tamed—are nearly always unsuitable, inappropriate, and frequently illegal pets.

The major purpose of this activity is for students to be able to distinguish between wild and domesticated animals.

MATERIALS

magazine or newspaper pictures of a wide variety of animals; poster board or heavy construction paper; glue

Age: Grades K-3

Subjects: Science, Language Arts, Art

Skills: classification, media construction, observation

Duration: 60 minutes

Group Size: any

Setting: indoors

Conceptual Framework Reference: I., I.B.3, I.B.4, V.A.1

Key Vocabulary: animal, wild, domesticated

Appendices: None

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PROCEDURE

1. Ask students to bring pictures to class of as many animals as they can find in magazines or newspapers at home (or get them from magazines and newspapers available in school, if any). Ask the students to look for pictures of as many different animals as they can, telling them that animals are any living things except plants.
2. Once the students have assembled a collection of animal pictures, it is time to classify them. Students may work alone or in small groups. Talk with the students about wild animals and domesticated animals (like pets, farm animals, etc.) before they get started with their classifying.
3. Once the students have put their animals into two categories—either wild or domesticated—get out the poster board or construction paper and glue and ask the students to make two collages...one of wildlife, and one of domesticated animals. You can make a classroom gallery out of the products.

EXTENSIONS

1. Make a master list of the wildlife and domesticated animals. Use the words for spelling, and talk about the variety of animals found.
2. Younger students can take cut-outs of animals and put them where they fit—like birds in the sky, whales in the ocean, a deer in the forest.
3. Make mobiles that show “layers” of animals—in the sea, on land, and in the air. Build one huge mobile with an animal for each student that shows deserts, forests, mountains, seas, and the skies. Different colors of brightly-colored yarn can be used to hang the different animals in the mobile according to the ecosystem in which they live.

AQUATIC EXTENSIONS

1. Aquatic wildlife occurs in a variety of forms. Create a collage of aquatic animals, including many different kinds.
2. Create posters or collages of aquatic wildlife according to the habitat in which it lives. For example, there are a variety of possible freshwater as well as marine environments in which aquatic wildlife might live. Freshwater: stream or brook, lake, pond, river. Marine: ocean.

EVALUATION

Which animals have been domesticated: goldfish, horses, cows, ducks, boa constrictors, mosquitoes, bats, chickens, lions, eagles?



What's Wild

Beth Stombaugh's class

Students with developmental disabilities

Lead-up Activities conducted Oct. 4

Main activity conducted Oct. 4, 5, 6

Location: In classroom

Kathy Gordon's and Natalie Hetrick's classes

Students with multiple disabilities;

regular education students

Lead-up Activities conducted Nov. 7

Main activity conducted Nov. 7

Location: In classroom

Adaptations and Modifications Implemented for Each Factor

Presentation Methods

After leading a class discussion, Beth and her students brainstormed a list of wild and domesticated animals. For visual learners, Beth wrote these lists on big chart paper that students could refer to when assembling their animal pictures. Hearing all of the examples helped auditory learners.

No changes were needed for Kathy's or Natalie's students.

Lead-up Activities

Beth discussed holding scissors safely, not having them in your mouth or walking around with them. She also discussed and modeled "neat" cutting and how much glue to use.

Kathy reviewed names of animals before the activity using library books and language (vocabulary) cards. Her class had been to the zoo and were working on related vocabulary: zebra, horse, kangaroo, giraffe, elephant; some of the students were learning to identify words such as cat and dog. The students really responded to the animals they saw in person at the zoo.

Physical Environment

In Beth's classroom the students' desks were already arranged in a large U-shape. The furniture placement gives Beth enough room to maneuver in her wheelchair and work with students one-on-one at their desks if they needed help with cutting or gluing the animal pictures.

Kathy had her students work one-on-one with a peer from Natalie's class—they were seated at tables. Kathy and Natalie also made sure that there weren't any physical limitations when Kathy's students came into the room. They rearranged desks and other furniture as needed.

Material Adaptations

No changes were needed for Beth's students.

Kathy used adaptive scissors for two students. These are scissors that don't require having to put fingers in the holes; instead the handle is squeezed together to make the blades move in a cutting motion.



Kathy's and Natalie's students look for pictures of wild and domesticated animals.



Kathy's and Natalie's students place their pictures on the wild or domesticated murals.

Kathy and Natalie also used wildlife magazines so that students would have more success finding animal pictures.

Procedural/Rule Adaptations

After making lists as a group and having the background information presented, most of Beth's students could classify their animals independently. However, her lower functioning students needed her to ask them prompting questions such as "Do we take care of this animal?" "Do we keep this animal as a pet?" "Does this animal live by itself?" in order to classify their pictures. All other procedures were followed as written in the original activity.

Kathy and Natalie followed the procedures listed, but instead of having each student make their own posters, the students created two large murals: one depicting wild animals and the other domesticated animals. Kathy's students needed help and direction from their peers, such as hand-over-hand help in placing the picture, or they would point to where it should go on the mural.

Break Activity into Tasks

Beth conducted this activity over three days. It took her students a total of two hours to complete this ac-

tivity. They did the activity in three sessions of about 30 to 45 minutes each.

Kathy and Natalie conducted the activity in a 1-hour session. First, Kathy gave directions on what the students were to do: cut out pictures of animals, any kind of animals, wild or domesticated. The students needed approximately 20 minutes to complete this part of the activity. While the students were cutting out pictures, the teachers put up two large sheets of paper on the board for two separate murals: one would be for wild animals, the other for domesticated. On each mural were distinct areas showing water, land, and the sky. After the students cut out the pictures, Kathy led a discussion on the different animal pictures that the students had found, and the differences between domesticated and wild animals. The students then went up to the murals in pairs and had to decide which mural to glue the picture onto, and where on the mural to put the picture: land or water.

Evaluating the Activity

Beth asked students questions about different animals and they had to decide whether the animal was wild or domesticated.

In addition to a discussion about wild and domesticated animals, Kathy evaluated her students based on whether or not they were able to put the animal on the correct mural, and in the right place. For example: fish went in the water, and an elephant went on the land.

Extensions

Beth's class added to their brainstormed lists. They also made a class collage of Ohio wildlife based on a school-wide theme taking place at the time they did this activity. It was a large collage and covered the classroom door. Their collage won an award for the best primary grade collage.

Other Comments

Beth: "This activity worked well."

After the classes completed field-testing the activities, Karen Ricker interviewed the teachers and their assistants to get their impressions about conducting the activities, inclusion ideas, and how these activities related to their curriculum goals.

Other Considerations: A Conversation with the Elementary School Teachers*

Beth Stombaugh (teaches students with developmental disabilities)

Kathy Gordon (teaches students with multiple disabilities)

Val Ferretti (assists Kathy with her students)

Sandy Walton (assists Kathy with her students)

Natalie Hetrick (teaches a regular education group of students)

What surprises did you encounter in terms of what the students learned and how they responded to the activities?

Beth: They enjoyed them. Some of my students really got into the activities more than I thought they would. All of the activities took a lot longer than the book indicated. We needed a lot more time for all of the activities.

Kathy: During the activities there were times when I saw the peers from Natalie's class giving directions to my students and they listened—I loved that 'cause then they could be really independent. Some students were going to town on the leaf rubbings and they didn't need any help from anyone, and I was really pleased about that. They were really going with the flow, and it was good to see that the peers could help them achieve that. The peers felt good about being involved, and our students were really participating. These activities can promote inclusiveness.

Also, one of my student's parents noticed that some of the students were greeting her daughter more frequently and talking to her on the bus, and she wondered if it could be as a result of the environmental education activities we had been doing recently. This student now has more opportunity to interact with other kids during the inclusive activities.

Val: I was pleased to see that the regular education students got really involved in the activities and working with our kids.

Natalie: My students were really excited about the activities. We put it in the newsletter, and then a stu-

dent the next day asked me about when we would be doing the activities. There was ongoing awareness of the project. I looked forward to it, and I know that my students really enjoyed it, and the response was great.

What advice would you give to other teachers who want to conduct environmental education activities with students who have disabilities?

Beth: Try it. Kids enjoy it, they learn more when they do hands-on activities and when they're more involved with what they're doing. I think it helps them to learn and understand concepts better. You may have to modify some things, but I think it's possible for most groups to do. Figure out what the needs are of the students.

Kathy: I would encourage them to do it. I would encourage teachers to try to find the right level activity for the kids. Look at what else the activity can teach. You can teach language in all kinds of settings.

Val: Make it as hands-on as possible. The students have a chance to experience something new, to be involved on a different level.

Natalie: I would tell other regular education teachers that it would be a welcomed opportunity. The only suggestion is to keep things simple. Also, if you're creating something, some type of project, have an example that's already been done. Say "this is what we can do, let's see if you can do this." The kids are given a challenge. Also, Kathy and I spent a lot of time setting up the classroom, making sure the desks were set up so there weren't any physical limitations

when her kids came into our room. I spoke to my students ahead of time reminding them that they need to listen during activities. I made name tags for my students so that there was more of a personal level and Kathy would know who they were, it especially worked well when they were in groups. And definitely plan your time carefully. Also, give students ample time to collect materials, make sure all materials are available and ready ahead of time.

Natalie, did you feel that your students got enough out of these activities when working with Kathy's class because the activities were kept as simple as possible?

Natalie: I would continue the concepts. For example, with "Cold Cash in the Ice Box," we continued graphing their results later on, and related it to the scientific method.

In what ways would you use these activities with inclusive groups?

Beth: I would put higher functioning kids with lower functioning students and they can help each other. It helps build their self-esteem too, because they can all help each other.

Kathy: You need to really prepare the other class, the regular education class beforehand, about your students. Have them meet and get together for "getting acquainted" activities, so the other kids have a chance to know your students a little bit before doing an activity. If possible, try to have the other class be a similar size to your class, for grouping, or peer buddies. Include the other teacher too with planning the lesson—if the other teacher is not excited or involved then the inclusion won't work.

In what ways were these activities able to meet the educational requirements of your students in terms of their Individualized Education Program (IEP) or your curriculum?

Beth: On their IEPs a lot of the students have classification as their goals. Improving fine motor skills is also part of their IEPs for several of them. Most of the activities tied in with a unit we were doing already.

Kathy: The activities related to goals of sensory awareness and vocabulary enrichment. Social interaction with others is real important for my class. For them to sit in a group and listen to directions, and not act out would tie in with their IEPs. The social-be-

havioral things also related to IEP goals. I could always tie in more functionally related things, such as counting, language, and vocabulary development.

Do you plan to continue using these activities or other environmental education activities this year and next? If no, why not?

Beth: Yes. I haven't done a lot outside, just because it's difficult for me. I would like to do more activities outside. Luckily we have a wooded area in the back of the school. I do go overnight camping with my students which is definitely a worthwhile experience for all involved.

Kathy: What motivates me to do more activities, especially inclusively, is that Natalie is motivated to do more inclusive activities, so having a peer myself who will actively participate in the planning would help me be more inclined to do more of these activities. You need to have a teacher who is open to working with our kids, and excited about doing the activities together.

Is there anything else you want to say about your experience with conducting the activities?

Kathy: One thing that I had a hard time with is finding areas to make these activities meaningful for my kids. My students are lower-functioning than the other students in the project. I felt that was the most challenging aspect for me—to find things to do that made sense for my kids. For my students, I would see using these activities only in an inclusive setting.

Sandy: I think that by including special needs students with regular education students, you break down that fear barrier, and that unknown barrier that people take with them into adulthood. The other class begins to see our kids as being real people, that they're not to be feared, that they may not function in the same ways they do, but that's OK. I really feel that our society needs that fear barrier broken down.

Kathy: I don't think I could have done the activities without assistance from my teacher aides. They are trained to be able to deal with specific behaviors of my students. When you do activities like this with regular education students, the one thing the regular education students see is that it's fun, and although they view our students differently, they see our kids as more similar than different. They see them doing regular activities, and they start to assume that the

kids are more like them than different. It really helps them to view our students as more like themselves. It does promote friendships, it gives them opportunities through the activities to interact with our kids, and they're more inclined to talk to them and play with them during recess.

**Based on separate interviews with each teacher. Kathy, Val, and Sandy were interviewed together. This "conversation" has been edited for clarity.*

Middle School Teachers



Michele Raker-Morris, Willis Middle School
Teaches students with multiple disabilities

Danielle Whitcomb, Park Street Middle School
Teaches students with developmental disabilities

Dave Fitzgerald, East Muskingum Middle School
Teaches general science to an inclusive class that includes students with learning, behavioral, and developmental disabilities



Michele Raker-Morris' Class

Michele Raker-Morris teaches students with multiple disabilities at Willis Middle School in Delaware, OH. The school is located in an urban/suburban area. Michele is in her late 30's and has been teaching for 18 years, all in special education. She has a bachelor's degree in special education with a major in teaching students with mental retardation and a minor in teaching students with orthopedic disabilities. Michele was named Ohio Teacher of the Year in 1993. Assisting Michele on a daily basis is teaching assistant Toni Keckstein. Toni is in her late 30's and has worked as an assistant for seven years and with Michele for the past six years. One of the students in Michele's class also has a full-time aide assigned to him.

Michele has nine students: five boys and four girls ages 12 to 14 in grades six through eight.* All of Michele's students are developmentally disabled and have some other type of disability: their IQ scores are between 40 and 60 and their mental development ranges from ages four to nine (an IQ score of 100 is considered the norm). Several of the students also have behavioral problems, very poor attention spans, and low reading skills; two students are non-readers. Annie is in remission from brain cancer and has lost some brain function; she also takes many medications. Robert is also on medication for health and behavior problems. Eileen is deaf and has a heart condition and Lynn has spastic cerebral palsy; she wears braces on the back of her legs from the foot to the knee and also wears a back brace. Joshua experienced head trauma in a car accident five years ago and uses a wheelchair to get around; he had to relearn all body functions. Danny is a non-reader and non-verbal; he cannot talk but can make sounds. This is his first year in a public school system. He has hydrocephaly and has shunts on both sides of the brain for drainage. He has his own full-time aide in the classroom to assist him.

Most of Michele's students stay with her for the school day. All of her students are in an inclusive setting with other students one hour each day for lunch and "Prime Time," a 30-minute session for games and other activities. In addition, eight of Michele's students receive occupational therapy; eight receive speech services; and three receive physical therapy. Speech, occupational, and physical therapies are made available by the school district.

Danielle Whitcomb's Class

Danielle Whitcomb teaches students with developmental disabilities at Park Street Middle School in Grove City, OH. The school is located in a suburban area. Danielle is in her late 20's and has been teaching for seven years, all in special education. She has a bachelor's degree in special education and is certified to teach K-12 students with developmental disabilities. Assisting Danielle on a daily basis is teaching assistant Patti Ranelli. Patti is in her late 30's and has worked as an assistant for five years and with Danielle for the past three years. She is currently working towards her degree in special education.

Danielle has 10 students: five boys and five girls ages 11 to 15 in grades six through eight.* All the students are developmentally disabled: most have IQ scores in the 40 to 60 range. In general, her students have low academic and social skills. Several of the students have limited fine and gross motor skills—they have trouble writing and walking. Angela has spina bifida but can walk on her own. Ross is visually impaired with low motor skills and doesn't talk or communicate well. Jeff has severe asthma and Andy has Down syndrome.

Most of Danielle's students stay with her for the school day except for the unified arts program. Her students are in an inclusive setting with other students for art, music, and computer classes. All of her stu-

dents go to an adaptive physical education class and receive occupational therapy services. In addition, four students receive speech therapy and her student with visual impairments receives orientation and mobility services. All of these services are provided by the school district.

Dave Fitzgerald's Class

Dave Fitzgerald teaches general science to an inclusive class that includes students with learning, behavioral, and developmental disabilities. He teaches at East Muskingum Middle School in New Concord, OH. The school is located in a rural area. Dave is in his early 40's and has been teaching for 17 years, all in science. He has a bachelor's degree in K-12 education and is certified to teach general science to students at the middle and high school levels. Assisting Dave on a daily basis with this particular class is teaching assistant Marsha Matheney. Marsha is in her late 30's and has worked as an assistant for five years and with Dave for the past two years.

For this project, Dave focused on his first period inclusion class of 32 students: 19 boys and 13 girls ages 11 to 12 in grade six.* Seven of the students are classified as having learning, behavioral, or developmental disabilities. Four students have learning dis-

abilities; their IQ scores are slightly below the norm of 100. William has limited reading skills and poor writing skills, but he has an excellent memory and listening skills. Most of his science tests are given orally. Samantha has reading problems, and Tim gets distracted easily. Charlie has fine motor problems, writing difficulties, reading problems and has difficulty retaining information. Cara and Donna are developmentally disabled, have lower IQ's and reading and writing problems. Evan has behavioral problems, is a poor listener, doesn't sit still, and is on medication. One student goes to a resource room for language arts, one goes for math, and three go for both language arts and math.

These seven students are included in all activities that comprise a middle school science class. They are part of the class, and they need to meet the same expectations. Dave and Marsha noted that they didn't have to make many changes to the activities field-tested. Some of the students with learning and developmental disabilities do better on assignments than the other students because they get extra help from Marsha in reviewing and studying.

**All students' names have been changed to maintain confidentiality.*

Activities Field-Tested with the Middle School Students

Pass the Plants, Please (Project Learning Tree)

A-Maze-ing Water (Project WET)

The Thicket Game (Project WILD)

Why were these activities selected?

Pass the Plants, Please

- It related to unit on nutrition conducted earlier in the year.
- The activity corresponded to on-going study of food groups.
- The activity fit into health and nutrition goals for students.
- The students do a lot of cooking in school, and like to learn about food.

A-maze-ing Water

- Everybody could participate in the activity, even if they couldn't do every part, every student was able to be involved with it.
- The activity was hands-on—it was something students could see and do.
- It related to class study of the water cycle, ecology and pollution.
- Measuring the dough ingredients for Option 2 related to the students' math skill goals

The Thicket Game

- The activity was broad-based enough so that all the students could participate, from the lowest to highest functioning students.
- There wasn't any writing or reading involved, therefore none of the students would feel that they couldn't do the activity.
- It involved a lot of gross motor movement and motion.
- The activity gave students the opportunity to get up and move.
- Conducting the activity with another class enabled the students to understand the differences in other people, and to focus on having to cooperate with another class.
- It related to a unit on animals.

16 PASS THE PLANTS, PLEASE



LEVELS

Part A: K-8 Part B: 3-8 Part C: PreK-8

SUBJECTS

Science, Social Studies, Math, Language Arts

CONCEPTS

- Humans throughout the world create differing social, cultural, and economic systems and organizations to help them meet their physical and spiritual needs. (3.2)
- The standard of living of various peoples throughout the world depends on environmental quality; the availability, use, and distribution of resources; and the societies' political structure and culture. (3.3)

SKILLS

Discussing, Identifying Attributes and Components, Organizing Information, Researching, Analyzing

OBJECTIVES

Students will ① identify edible plant parts and give examples of each, ② describe how plants are used to make various kinds of foods, and ③ discuss the importance of plants in people's diets.

MATERIALS

Copies of student page 53, ingredients and utensils for snack recipes (see Part C)

TIME CONSIDERATIONS

Preparation: One hour

Activity: Two 50-minute periods

Overview

Chocolate candy. Apple pie. French fries with catsup. Tortilla chips with guacamole dip. Thanks to plants, these and many other favorite foods are ours to enjoy. Try the following activities to get your students thinking about just how big a part plants play in our daily diets.

Background

People and other animals eat parts of many different plants. For example, people eat roots (carrots, parsnips); above ground and underground stems (asparagus, onions, potatoes); leaves (lettuce, spinach); leaf stalks (celery); flowers (broccoli, cauliflower); fruits (apples, peaches, tomatoes, cucumbers); and seeds (wheat, rice, corn, pecans, walnuts, beans).

Nutrition is something that all people should be concerned about. According to the U.S. Department of Agriculture, most nutritionists recommend that in our daily intake of food we have ① 2-4 servings of fruits (a serving would be one medium apple, orange, or banana; half a cup of small or diced fruit; three-fourths cup of juice); ② 3-5 servings of vegetables (a serving would be one cup of raw leafy greens, or half a cup of other kinds of vegetables); ③ 6-11 servings of grains, bread, cereal, rice, or pasta (a serving would be one slice of bread, or half of a bun, bagel, or English muffin; one ounce of dry ready-to-eat cereal; half a cup of cooked cereal, rice, or pasta); ④ 2-3 servings of dairy foods (a serving would be one cup of milk or yogurt, or about one and a half ounce of cheese); ⑤ 2 servings of meat, poultry, fish, legumes, eggs, or nuts; and ⑥ very sparing amounts of fats, oils, or sweets. (These servings may vary slightly among males, females, children, and adults.) Foods with complex carbohydrates and fiber such as fruits, vegetables, whole grains, breads, cereals, and legumes (peas or beans) should make up the majority of a person's diet. A diet too high in fat, especially saturated fat and cholesterol, could result in a number of health problems such as heart disease.

It also matters how food is prepared. For instance, a person should

limit their intake of foods that have been heavily processed with added sugars and preservatives or fried in oils and fats. These foods are generally less nutritious.

Getting Ready

Make copies of student page 53. If you plan to use recipes in class, you may want to bring and prepare ingredients and utensils in advance. You can also ask students to bring ingredients and utensils, or you can take them on a field trip to the supermarket.

PART A PLANTS IN THE PIZZA?

Doing the Activity

1. Have the students brainstorm a list of foods that come from plants. The foods can be either plants themselves (such as potatoes) or made from plants (such as french fries). Write the students' ideas on the board.

2. Point out that many plant foods are not obvious. For example, tortilla chips are made from ground corn. Bread is made from wheat or other grains. Even pizza, with its wheat crust and tomato sauce, is made mostly from plants. Ask the students if they can think of others, and add their suggestions to the list.

3. Examine the list and have the students try to identify the plant parts each food comes from. On the chalkboard, write the plant part categories in which the foods belong (see Background). What animals also eat these plant parts?

NOTE—It is important to make clear through discussion that not all parts of an edible plant are edible. Sometimes we may eat one part of a plant while another part is poisonous. Animals can often eat plant or plant parts that are inedible or even poisonous to people.

4. Pass out copies of page 53, "Veggie Plate," to each student. Have them fill in the name of the appropriate plant part on the blank line below the word identifying the food. If they want, they can also color the page. Afterward, go over the answers with the students (see Answers below).

5. Older students can research the vitamins and minerals provided by each of the veggies on the plate.

PART B

ANALYZE YOUR LUNCH

Doing the Activity

1. Have each student make a chart (see sample below), and tell the students that they are going to take a close look at their lunch from Monday through Thursday. They will fill in the chart with information about the plant foods they eat for lunch each day.

2. Go over the charts initially with the students. Each day after lunch, give them time to add information to their charts.

3. On Friday, discuss the data with the students. Did some plant parts show up in their lunches more often than others? If so, which ones?

4. Have the students create a bar graph showing the occurrence of different plant parts in their lunches during the week. How might this change from season to season? (summer fruits)

5. With older students, discuss what a balanced meal is (see Background). Have students create a balanced diet of plant foods. Students could be introduced to concepts about sound nutrition and human health.

PART C

TREE-LICIOUS TREATS AND OTHER SNACKS

Doing the Activity

Hold a plant foods feast! Page 52 has a few recipes you can try. Ingredients that come from trees and other plants are in italics. (You might want to have students bring in some of the ingredients.)

Enrichment

1. Take the students on a field trip to the supermarket. In addition to shopping for ingredients for Part C, have the students work in groups to gather data on the prevalence of plants in different products. Each group can focus on a particular aisle, reading food labels and writing down information about the plant ingredients in each product. Back in the classroom, the students could create charts depicting their data. Are products healthy just because they are made from plants? What factors go into deciding whether a food product is healthy? (Low fat, low sugar, low salt, high carbohydrate, high protein, vitamins, etc.)

2. Take students on a trip to a farm to see where their food comes from.

3. Have the students research some familiar spices used in different types of ethnic cooking such as Mexican, Indian, Italian, Middle Eastern, etc. Individuals or small groups could discover where and what plants these ingredients come from and other information, and then present their findings to the rest of the group. Bring in some ethnic foods and have students see how they like the flavor that spices give those foods.

SAMPLE CHART

MON				
TUES				
WED				
THURS				

END NOTES...

ASSESSMENT OPPORTUNITY

While enjoying the plant foods you prepared (or while eating lunch on any day), get your students to think about where the ingredients of the food come from. You might ask for example: On what part of the tree do walnuts grow? How about avocados or figs? How is maple syrup made? Where can you find sugar maple trees? What ingredients are in bread? By using what they've learned in the activity, they will be able to figure out the origin of many common fruits, vegetables, and food ingredients, especially the ones that were specifically discussed.

RELATED ACTIVITIES

We All Need Trees, Tree Treasures, People of the Forest, Tropical Treehouse

Answers for Veggie Plate

cashew	seed
onion	underground stem
asparagus	aboveground stem
cherry tomato	fruit
spinach	leaf
broccoli	flower
apple	fruit
celery	leaf stalk
carrot	root

RECIPES

Maple 'n' Walnut Spread

(Makes enough spread for about 25 people.)

8-oz. package of cream cheese, softened
1/2 cup chopped *dates*
1 1/2 cups nondairy whipped topping
1/4 cup *maple syrup*
1 cup finely chopped *apple*
enough bagel halves for everyone in your group
1 cup chopped *walnuts*

Combine cream cheese, whipped topping, and syrup in a large bowl. Add apple, walnuts, and dates. Stir until well mixed. Spread onto bagel halves and serve.

Guacamole

(Makes about 2 1/2 cups.)

1/4 cup sour cream
2 soft, ripe *avocados*
1/2 teaspoon *chili powder*
2 tablespoons *lemon juice*
dash *paprika* and *black pepper*
2 small *tomatoes*, chopped
1/4 cup *black olives*, chopped (optional)
2 cloves *garlic*, minced
corn chips
1 teaspoon salt

Mash the avocados in a small bowl. Thoroughly mix in the lemon juice. Chop the tomato and add it to the mixture. Blend in the garlic, salt, sour cream, black pepper, and chili powder. Sprinkle with paprika and serve with corn chips.

Hummus

(Makes about 4 cups.)

3 cups cooked *chick peas* (also called *garbanzo beans*)
1/2 to 3/4 cup *tahini* (*sesame seed paste*)
3 cloves *garlic*, minced
1 teaspoon salt
black pepper to taste
3 tablespoons *tamari* (*soy sauce*)
cayenne pepper to taste
1/4 cup *lemon juice*

Put all ingredients in a food processor or blender on a high setting and mix until ingredients are smooth and well blended. Serve with pita (pocket) bread.

Tree Treats

(Makes three to four dozen treats.)

1 cup dried *apricots*
1/2 teaspoon ground *cloves*
1 cup dried *figs*
1 teaspoon *cinnamon*
1 cup dried, pitted *prunes*
1 small package shredded *coconut*
2/3 cup *almonds*

Grind the apricots, figs, prunes, and almonds in a food grinder or processor. Stir in the spices. Mold the mixture into little balls and then roll the balls in the shredded coconut.

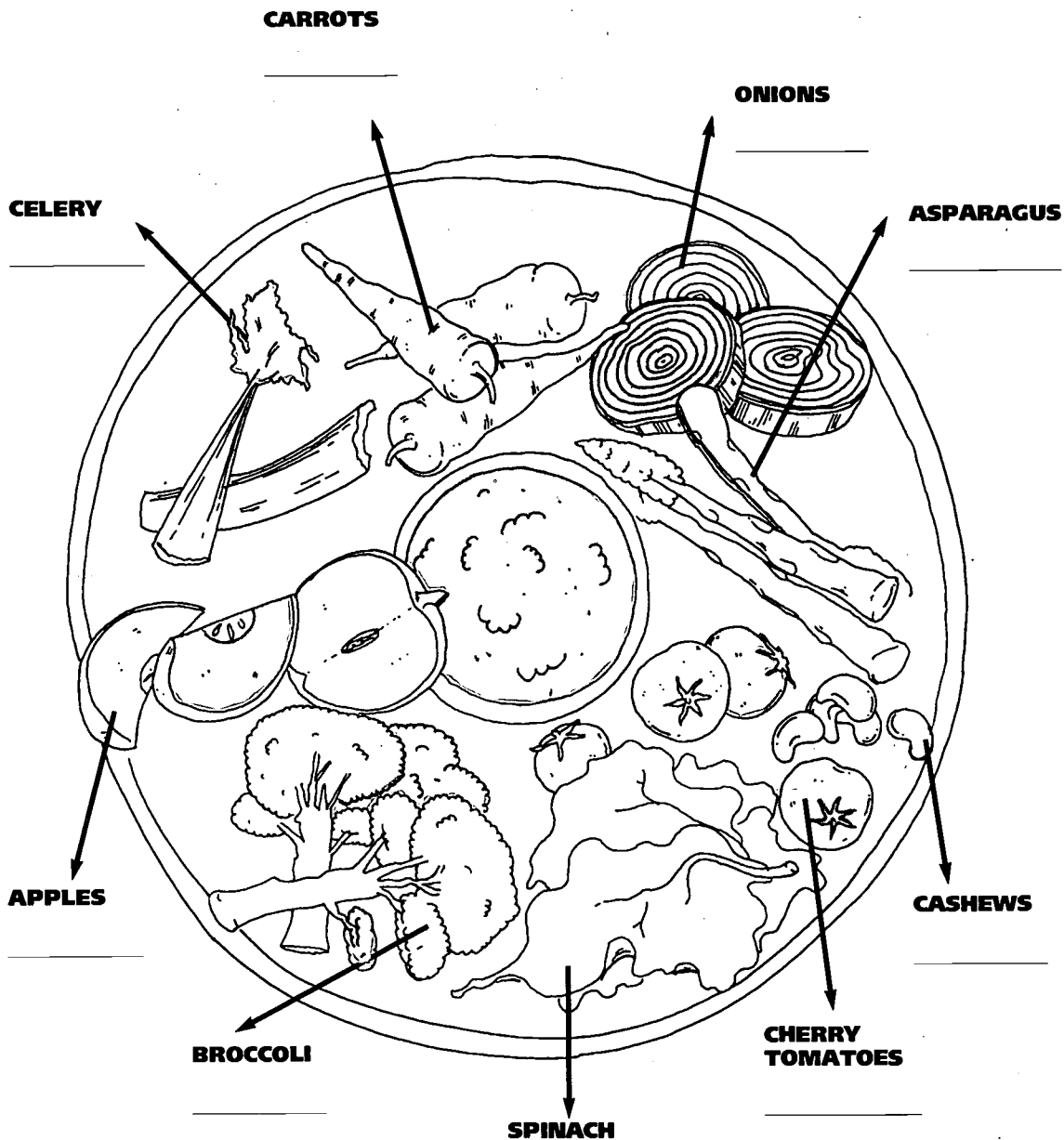
Sunflower Seed Cakes

(Adapted from an Iroquois recipe from about the time of the first Thanksgiving.)

2 cups shelled *raw sunflower seeds*
6 tablespoons *cornmeal*
1 1/4 cups water
vegetable oil or butter for frying
3/4 teaspoon salt

Put the sunflower seeds and water into a large pot. Bring the mixture to a boil and then simmer for an hour, stirring occasionally. Remove from heat and blend in the cornmeal, one tablespoon at a time. This will make a stiff, sticky dough. Add salt and pat into 3-inch by 1/2-inch cakes. Heat the oil or butter in a frying pan until hot. (If you don't have access to a stove at school, an electric frying pan can be used.) Add the cakes and brown on either side. Drain on paper towels, and serve with berry jam or cranberry sauce. (You could also make the batter the night before and refrigerate it until frying it the next day at school.)

VEGGIE PLATE



Pass the Plants, Please

Michele Raker-Morris' class

Students with multiple disabilities

Lead-up Activities conducted Oct. 30–Nov. 3

Main Activity conducted Nov. 9–10

Location: In classroom

Dave Fitzgerald's class

Students with learning, behavioral, and developmental disabilities in an inclusive science class

Main Activity conducted Nov. 3, 5–10

Location: In classroom

Danielle Whitcomb's class

Students with developmental disabilities

Main Activity conducted Nov. 3, 6–10, 17

Location: In classroom

Adaptations and Modifications Implemented for Each Factor

Presentation Methods

Michele brought in a bowl of dried vegetable seeds: corn kernels, peas, and nuts to let the students feel, see, and eat the seeds. She used sign language with Eileen.

Danielle enlarged the picture of the veggie plate so it could be seen more easily. For students who have difficulty writing, Danielle gave students Post-it Notes with the answers for the veggie plate so they wouldn't have to actually write the word. Students could identify the answer on a Post-it Note and put it where it belonged on the veggie plate. The students also made veggie plates with real food, so they could taste, smell, and examine.

Dave grouped students heterogeneously so that there was an even proportion of readers, non-readers, writers, and non-writers in each group.

Lead-up Activities

Michele's class studied food groups and the food pyramid for the first nine weeks of school. For one week before the main part of the activity was conducted, students would say what they actually ate for lunch each day, and the class would discuss what foods came from plants (about 15 minutes each day).

Danielle led discussions about food as plants. Before conducting Part B, the students reported what they had for lunch and determined which plant the food was from originally. This was done every day for one week, about 30 minutes each session.

Dave discussed how plants grow and which foods come from plants; this discussion was held on the same day as the activity.

Physical Environment

Michele's classroom furniture was already arranged in a non-restrictive manner to give students space to move between their desks and a common work table. This is especially important for students with limited mobility.

Danielle made sure that all students could see the chalkboard. Her classroom furniture was already arranged in a manner that reduces physical limitations in the room for students who have difficulty walking, or who are visually impaired.

Dave's classroom is a large science lab. Students' desks were already arranged in a large U-shape. Some of the desks were also placed inside the U so that 32 students can fit in the room. All of Dave's students can walk without difficulty; moving around desks for group work is not a problem for them.

Material Adaptations

Michele brought in dried vegetable soup, corn kernels, peas, nuts, and had pictures of others foods from plants.

Danielle enlarged the veggie plate sheet and she also brought in real food for the veggie plate. She made small charts for each student to use for recording food data for Part B; the chart was similar to the one in the



Students in Dave's class work in groups to brainstorm a list of foods that come from plants.

original activity. Danielle created sets of Post-it Notes with the veggie plate answers, and individual cards with the answer choices for students to use (see Procedural/Rule Adaptations). She also made a master class chart that focused on the foods they ate that came from plants.

No changes were needed for Dave's students.

Procedural/Rule Adaptations

In addition to the dried vegetable soup and the other foods, Michele wrote the parts of the plants on the board. For Part A, when the students worked on the veggie plate page, they could use the board references to help them complete the plate. Michele did Part B, but did not make the recipes in Part C.

For Part A, Danielle used real food for each student to have their own veggie plate so they could taste, see, and smell the foods. The food she brought in was the same exact food on the veggie plate. That helped make the activity real and hands-on for students. For the veggie plate exercise, the answers written on Post-it Notes were for students who have a difficult time writing. They wouldn't have to actually write the word, instead they would identify the word on a Post-it Note and put it where it belonged on the veggie plate. Danielle also gave students index cards with the answer choices instead of putting the information on the board. The answers were not in order and each student had their own card to look at and determine where the answer went on the plate. Part A was conducted on one day for 1.5 hours—the time was extended to allow for comprehension and additional examples.

For Part B, students recorded the food they ate on their own charts, and circled in red crayon the food that came from plants; they did this for one week. Danielle also made one big chart that the class completed as a whole. The master chart focused on the foods they ate that came from plants.

Dave divided the students into groups. For Part A, each group discussed and brainstormed a list of food that came from plants. The plant categories were written on the board as a chart. One student from each group would go up to the board and add a food for each category. One student from each team went up to the board in rounds. Dave conducted part B, but did not make the recipes in Part C.

Break Activity into Tasks

Michele conducted the activity over two days. On Day 1, she did part B with her class. The students went through a week of the school lunch menus and circled all food they thought came from plants. Each student had their own list of the menus. They circled food instead of making a chart. Michele gave students time to do this on their own, and then reviewed as a class (45 minutes for this part).

On Day 2 Michele conducted Part A and introduced the activity using dried vegetable soup and seeds. The class brainstormed parts of plants, and examples of each part, and Michele put this information on the board in a chart form. Each student completed their own veggie plate. Michele and her teaching assistants helped students as needed.

Danielle conducted Part A by discussing the idea that food comes from plants and providing examples. She did Part A with her class using the procedures discussed above in Procedural/Rule Adaptations. For Part B students reported what they had for lunch and determined from which plant the food came. Part B was conducted for a week (5 days) for about 30 minutes each session.

Part C was conducted on a separate day and the class made Sunflower Seed Cakes. Students made the recipe themselves by following illustrated and written directions. For students with difficulty reading, Danielle illustrated each step. She would draw a picture of a measuring cup with the proper amount such as half and quarter amounts. She also drew actions such as pouring ingredients into a bowl and stirring.

It took an hour to make the sunflower seed cakes from start to finish, including eating them.

Dave and his students completed Part A on one day; they did the activity for 80 minutes as described in Procedural/Rule Adaptations. Students were divided into groups of four or five, which was helpful to the students with reading or writing difficulties. Dave used the veggie plate as homework. Part B was conducted by the students over a 5-day period and concluded on the last day with a class discussion.

Evaluating the Activity

Michele used the Veggie Plate sheet for evaluation, as well as student involvement in the activity. Whether or not the students were able to complete the sheet correctly was the basis for evaluating this activity.

Danielle evaluated whether the students were able to graph the food they ate into plant categories. They also talked about health and nutrition as well as a balanced diet.

No changes were needed from the original activity for Dave's class.

Extensions

Michele made french fries with her students so they could see that the fries came directly from a potato, which grows in the ground. Most of the students had no idea where a french fry really came from. In the spring, Michele plans to get her students involved with gardening.

Other Comments

Michele: "Once I came up with a way to introduce the activity, I didn't have to modify the worksheet—I only had to provide additional help on the board. In the future, I would bring in examples of the real plants used on the veggie plate. This would have been more helpful to the kids, especially Danny who was unable to do the worksheet."

Danielle: "This concept was extremely difficult for my students to understand. The kids understand the plants but had difficulty distinguishing types. It was difficult for them to understand that the tomato sauce on their pizza was actually a vegetable because it was from tomatoes. Breaking down each part of food was hard for them to do. If I could do this lesson all over, I would make bread with the students so they could see how flour, water, and other ingredients form together to make bread. I would also plant a few vegetable seeds, and watch over a few months how the seeds grow into a plant, and then form a vegetable."

"I liked tasting the different food."

"I liked the sunflower cakes."

Students in Danielle Whitcomb's class

A-maze-ing Water



■ Grade Level:

Lower Elementary,
Upper Elementary,
Middle School

■ Subject Areas:

Environmental Science,
Health

■ Duration:

Preparation time:

Option I: 15 minutes
Option II: 50 minutes

Activity time:

Option I: 30 minutes
Option II: three 50-minute
periods (includes drying
time for maze)

■ Setting: Classroom

■ Skills:

Organizing (manipulating
materials); Interpreting
(identifying cause and ef-
fect); Applying (designing)

■ Charting the Course

Prior understanding of how
water flows through a wa-
tershed supports this activ-
ity ("Branching Out!"). Stu-
dents can investigate the role
their school plays in adding
to the city's runoff in "Rainy-
Day Hike." The activity
"Sum of the Parts" can be
adapted to include the
schoolyard as a nonpoint
source contributor.

■ Vocabulary

storm drain, nonpoint
source pollution, runoff,
contaminants

*Imagine turning on your water tap and
having everything that you dumped into the
gutter last week flow into your glass.*

Summary

Students guide a drop of water
through a maze of "drainage pipes" to
learn how actions in the home and yard
affect water quality.

Objectives

Students will:

- describe urban forms of pollution.
- provide reasons why people should
monitor what they put on their lawns
or in streets.
- identify ways to treat urban runoff.

Materials

For Option 1:

- Can or bottle labeled "chemicals" or "oil"
- Chalk
- Pieces of self-sticking paper, flour, or other
materials to represent pollutants found in
urban runoff

For Option 2:

- Cardboard 8 inches (21.3 cm) x 10 inches
(25.4 cm) (1 per student or group)
- Wax paper
- Tape
- Wood glue
- Clay or modeling dough (Following is a
simple recipe for modeling dough:
Knead together 1 cup (22.4 g) flour, 1/2
cup (11.2 g) salt, 3/4 cup (180 ml)
boiling water, 1 tablespoon (15 ml)
salad oil, and 1 tablespoon (5 g) alum
[optional]; if too sticky, add more
flour and salt.)
- Water
- Sugar, salt, pepper, food coloring, oil, and
other materials to represent pollutants
found in urban runoff
- Wax marking pencil
- Pipette or eyedropper
- Pencil and paper

Making Connections

Most students have washed family cars,
seen litter on the sidewalk, or walked a
dog. In urban settings, car wash deter-
gent, litter, animal waste, paint, and oil
all wash into the street and down storm
drains. Investigating what happens to
these materials after they enter drainage
systems helps students understand how
these materials can affect water supplies
and aquatic plants and animals.

Background

Removing water quickly and efficiently
from city streets, parking lots, and
schoolyards following precipitation or
snowmelt is an important task for
municipal governments. Water flowing
through city drainage pipes is often
referred to as an urban watershed. Before
storm drainage systems were common,
cities experienced localized flooding
because of poor or nonexistent drainage
patterns and flooded sewer systems that
overflowed with storm water. Both
circumstances caused significant health
and safety concerns that warranted
solutions. Today, most city governments
require housing developers to install
city-approved storm water drainage
systems.

Traditionally, water diverted to storm
water systems received little or no
treatment before flowing into a stream or
body of water. Environmental agencies
found that water draining off lawns,
sidewalks, driveways, parking lots, and
streets carried significant amounts of
pollutants. These pollutants included
fertilizers, motor oil, litter, pesticides,
animal waste, and other contaminants.
Receiving waters were degraded, and
aquatic plants and animals were affected.
Some communities resolved the problem
by channeling storm runoff into a
wastewater treatment plant. But this is
an expensive procedure, and some plants
are unequipped to process the inorganic


A-Maze-ing Water is used with permission from The Watercourse/Montana State University and the Council for Environmental Education from the Project WET Curriculum and Activity Guide. Copyright © 1995. The complete Activity and Curriculum Guide can be obtained by attending a Project WET workshop. For more information call the National Project WET office at 406/994-5392.

materials found in urban runoff. A more cost-effective system was needed to treat storm water discharge. The scenario below describes one such water treatment system.

Imagine the parking lot of a large shopping center. Each year thousands of cars park in the lot, each depositing a small amount of engine oil- and grit (loosened road materials). A gentle rain begins to wash the lot. At the lot's lowest point, oil- and gas-tainted runoff water begins to flow into the street's gutter. A few blocks away, an urban river flows, filled with floating debris, sediment, and multi-colored water from another street, then another, and another. The flow now nearly fills a ditch constructed to channel urban runoff. From a distance the storm water in the drainage system appears dark-colored. Perhaps the road salt used to melt ice on roads and sidewalks has mixed in. How about the paint a neighbor pours into the gutter? The pet waste near the sidewalk? Whoosh, more water moves by! What next? What about the nearby stream and the people using water downstream for their drinking supply?

You follow the water to a large pond that the city constructed to catch storm water. The water in the pond is now moving slowly through cattails and other emergent wetland vegetation, and its color has started to change. Where is the debris and the sediment? And what about other waste materials? A woman from the city health department tests the water as it enters a small stream; she concludes that the water is cleaner than the river it is about to enter.

DUMP NO WASTE



DRAINS TO STREAM

Solutions to urban storm water pollution problems require participation by everyone. Homeowners can help by carefully following directions when applying pesticides and fertilizers, using biodegradable products whenever possible, cleaning up pet wastes, not disposing of household wastes in the street, and fixing oil leaks in vehicles. City sanitation departments can supply information on proper disposal procedures for paint cleaners, used oil, or leftover paint. In addition to developing wetland systems to help treat urban runoff, many city governments periodically sweep roadways to remove wastes. They plant greenways and preserve green space to help filter runoff from streets and parking lots.

Procedure

▼ Warm Up

Show students a can or bottle labeled "chemicals" or "oil." Tell students you need to dispose of the chemicals and plan to dump them in the street in front of the school. Ask students if they think this is a good idea. Have students describe what they think will happen to the waste material. Read the first paragraph of the scenario in the **Background**. Ask students what they think might happen to the runoff.

▼ The Activity

Following are two options for simulating urban runoff being collected within a storm drain system.

Option 1

1. Discuss how water is used to clean things, such as the surface of a table after a spill. Relate how rainwater washes the outdoors. Explain that as it flows over plants, soil, and sidewalks, it picks up and carries away soil and other materials. Inform students that cities use water to clean the waste from city streets and sidewalks. Often the water goes down storm drains, collects in pipes, and flows to a river or a treatment plant. (If a media center or water table is available, younger students can use pieces of tubing and plastic pipe to create a mini-water transport system. They can explore how pipes help water travel over distances by pouring water into one end of a tube and watching it run out in a different location.)

2. Draw a simple but large maze on the school blacktop (see example on page 222) or arrange the chairs in the classroom to form the maze. The maze represents underground pipes that collect and transport surface water that has flowed down storm drains. Have students run the maze. Inform them they are water flowing through the drainage pipes to the river or treatment plant.

3. Discuss sources of water that run into the storm sewer system (streets, lawns, parking lots, etc.). What might this water carry? (Oil from cars, fertilizers, litter.)

4. To simulate surface water transporting pollutants into drainage pipes, have several students



position themselves along edges of the maze. They represent storm drains and the contaminated water flowing through them. They should hold pieces of self-sticking paper or bowls of flour to symbolize the pollutants. When other students run through the maze, the students representing storm drains stick pieces of paper or sprinkle flour onto the clothing of the maze runners to represent contaminated water mixing with water (that may or may not be clean) flowing through the system. Allow students to take turns playing different roles.

5. After several trips through the maze, discuss what happens to this dirty water. What if it flows into the river? Can treatment plants process all the waste? Have students summarize why they should not litter.

6. To represent a treatment system, have two students stand at the maze exit. Similar to the game London Bridge, the two treatment students "trap" each passing water student and remove as many pollutants as possible before he or she goes into the river. What are students' attitudes about the quality of this water passing into the river?

Option 2

1. Prepare or have students make mazes representing storm pipes carrying away street runoff. A suggested pattern is provided on page 222. Build each maze on a piece of cardboard covered with wax paper. The walls of the maze are made from clay or modeling dough. Coat the walls and floors of the maze with wood glue and allow to dry. (Allow one day for clay to dry, and one day for glue to dry.)

2. The maze should have one starting point and two exits. One exit leads to a sewage treatment plant, and the other flows into a

stream. Use a wax pencil to label the exits.

3. Have students list materials people purposefully or inadvertently add to gutters and storm drains. Have students draw a picture of a city street depicting these activities. They can switch drawings with a partner to see if their classmates can identify the polluting activities.

4. Place drops of food coloring, salt water, and sugar water mixed with pepper on different places in the maze. (See *Suggested Maze Pattern*.) Allow one day for the water to evaporate. Drops of oil can also be placed at certain locations. These all represent contaminants added to urban waste systems.

5. Tell students to place a drop of water at the starting point and to tilt the maze so that the drop flows slowly toward one of the exits. Toward which one should they aim?

6. As the drop flows through the paths, it should pick up dye from the food coloring, particles from the salt and pepper, and possibly oil droplets. This represents water moving through a municipal storm water system.

7. When the drop reaches the exit, have students describe what the drop looks and feels like. If it ended in the treatment plant, the drop gets replaced with a clean drop of water. If it ended in the overflow



("untreated water" exit), the drop is added to a cup labeled "stream."

▼ Wrap Up and Action

Discuss the problems associated with untreated urban runoff entering rivers or other bodies of water. Have students identify or research ways contaminated water affects aquatic life and drinking water supplies.

Introduce students to the many actions people can take to limit contaminants entering urban runoff. These include properly disposing of pet waste and litter, and discarding chemicals and oils according to manufacturer's directions. Inform students that many cities have developed systems to treat runoff. Refer to the scenario in the **Background** and read the second paragraph.

Have students contact their local wastewater treatment plant or public works department to determine whether their street runoff enters the treatment plant or if it flows directly into the river or filters into ground water systems.

Students may want to begin a storm drain monitoring program. This involves sending messages to the community illustrating how and why it should monitor what flows down streets into storm drains. Students can design a brochure describing ways individuals can reduce their contribution to surface and ground water pollution via urban runoff. Students can contact recycling centers, wastewater facilities, or their state department of natural resources to research ways individuals can reduce the amount of fertilizers and pesticides they use, choose alternatives to home and garden chemicals, and safely dispose of household wastes. If the city or county recycling office has a hazardous waste collection program, this could be included in the brochure as well.

In addition to the brochure, students can start a stenciling program. Students can make or purchase a stencil (see **Resources**) with a message about monitoring what flows down storm drains (e.g., "DUMP NO WASTE—DRAINS TO STREAM"). The stencils are used to spray-paint the message near neighborhood storm drains. Students can include information about the stenciling and its intent in their brochure, which they deliver to community members who live near the drains. Make sure students obtain permission from city or county public works departments before beginning the project.

Assessment

Have students:

- identify urban sources of pollution (*Warm Up*, **Option 1**, step 3, and **Option 2**, step 3).
- design mazes to simulate storm water drainage systems (**Option 2**, steps 1-4)
- explain why certain materials should not be dumped into the

street or used carelessly (**Option 1**, step 5 and *Wrap Up*).

- design a brochure describing steps individuals and communities can take to prevent surface water contamination (*Wrap Up*).

Extensions

Students can research alternatives to house and lawn chemicals and cleaning agents. Contact the local recycling center, the waste treatment facility, or a local environmental group for details. Invite a representative from the local water treatment plant to enrich the activity. Visit a local gas station and have the manager explain what happens to oil after cars are serviced.

Resources

🍏 Cole, Joanna. 1986. *The Magic School Bus at the Waterworks*. New York, N.Y.: Scholastic, Inc.

Environmental Concern Inc., The Watercourse, and Project WET. 1995. Activities "Treatment Plants" and "Water Purifiers." *WOW! The Wonders of Wetlands*. Published through a partnership between Environmental Concern, Inc., St. Michaels, Md., and The Watercourse, Bozeman, Mont.

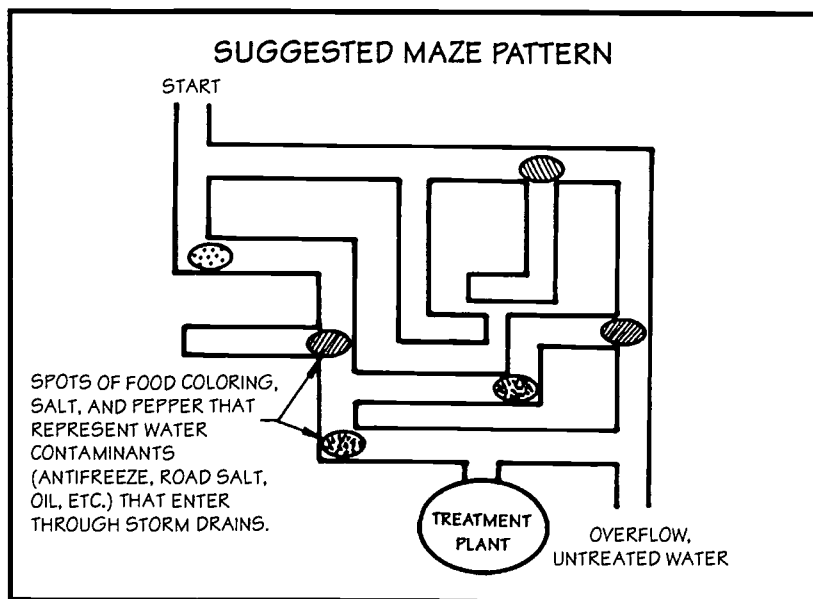
The Water Education Foundation, 717 K Street, Suite 517, Sacramento, CA 95814. (916) 448-7699.

For information on storm drain monitoring and stenciling programs, contact:

Step Coordinator, Oregon Department of Fish and Wildlife, P.O. Box 59, 2501 S.W. First Avenue, Portland, OR 97207.

Earthwater Stencils, 4425 140th SW, Dept. WT, Rochester, WA 98579.

Center for Marine Conservation, 306A Buckroe Avenue, Hampton, VA 23664.



A-maze-ing Water

Michele Raker-Morris' class

Students with multiple disabilities

Lead-up Activities conducted Nov. 27

Main Activity conducted

Nov. 27–Nov. 30 (Option 2)

Location: In classroom

Dave Fitzgerald's class

Students with learning, behavioral, and developmental disabilities in an inclusive science class

Lead-up Activity conducted Nov. 19, 20

Main Activity conducted Nov. 21 (Option 1)

Location: In classroom

Danielle Whitcomb's class

Students with developmental disabilities

Lead-up Activities conducted Oct. 24, 25

Main Activity conducted Oct. 26 (Option 1)

and Nov. 6, 7, 8 (Option 2)

*Location: Outside in parking lot for Option 1;
in classroom for Option 2*

Adaptations and Modifications Implemented for Each Factor

Presentation Methods

Michele divided each part of the activity into distinct steps, so the students could see and participate in each phase. She used sign language with Eileen.

Danielle gave lots of hands-on examples of runoff, where it is and how it works.

No changes were needed for Dave's class.

Lead-up Activities

Michele's class walked around the neighborhoods near school and talked about what they saw on the streets and where the pollution, water, and snow go.

Danielle read *The Magic School Bus at the Waterworks* by Joanna Cole (1986). The book discusses the water cycle and what happens when water goes through a treatment plant facility. Danielle spent about 20 minutes reading and discussing the story with students. The following day, Danielle did a simulation activity using glitter with beads. Using a shoebox lid, she sprinkled glitter on the lid for the students to see, and then took round plastic beads and rolled them down the lid and onto the floor. The students could see that the glitter stuck to the beads but would fall off as it rolled across the floor. This showed the class that the bead was picking things up and dropping the glitter off in different places. She related this concept to the idea that water in a stream can carry pollutants downstream through a storm drain.

Dave had conducted units on the water cycle, water pollution, recycling, and natural resources earlier in the school year. Right before conducting "A-maze-ing Water," he did an activity on how much water does a family use (e.g. for laundry, brushing teeth, flushing the toilet, using the dishwasher vs. washing by hand). Students had to record how much water their family used in one evening.

Physical Environment

Michele's classroom furniture was already arranged in a non-restrictive manner to give students space to move between their desks and a common work table when making their mazes. This is especially important for students with limited mobility. When going outside she made sure the path was clear for the student who uses a wheelchair and others with limited mobility.

Danielle's classroom was already arranged in a manner that reduces physical limitations in the room for students who have difficulty walking, or who are visually impaired. For the outdoor part of the activity, Danielle drew the maze with chalk in a parking lot behind the school.

Dave arranged the students' desks as a maze to represent the underground drainage pipes.

Material Adaptations

Michele made copies of the maze and glued them to oaktag board for the students to use as a model for their streets. The rest of the equipment and materials stayed the same.

Danielle used cornstarch, pepper, salt, flour, sticky paper, and soap shavings for Option 1; no changes in materials were needed for Option 2.

Dave used only Post-it Notes as pollution to stick on clothes.

Procedural/Rule Adaptations

Michele had each student hold their maze and she, or her teaching assistant, dropped the water onto the starting point. Some students had difficulty holding and tilting their mazes so Michele would help them with this process by placing her hands over the student's hands while they both held the maze. The students completed each step as written, except Step 3. Instead of drawing pictures of city sewers being polluted, the class discussed the materials people use that go down storm drains, and listed these materials on the board.

Danielle had her visually-impaired student go through the maze with some guidance from her teaching assistant. At the treatment plant part of the maze they had two checkpoint areas set up. For Option 2 the students put water through their mazes one at a time. Each student had a turn and watched as their classmates each had a chance to use the eyedropper. Danielle used a hand-over-hand technique (placing her hands over a child's hands) to make mazes with most of the students.

Dave had no changes for the procedures. The faster the water flowed, the less effective the treatment plant was in cleaning the Post-it Notes off the students.

Break Activity into Tasks

Michele conducted this activity over four days in 45-minute sessions each day.

Day 1: The class made model dough and city streets for the mazes. Michele used the recipe included in the original lesson, but doubled the recipe for the whole class. The dough was made as a whole group activity, each student helped make the dough and added the ingredients. Students made their

own mazes but some needed help following the maze lines.

Day 2: The students used glue to pave the streets.

Day 3: The class polluted the streets on the mazes using food coloring.

Day 4: Water was put through the maze's streets using an eyedropper.

For Option 1 Danielle followed the steps as written in the original activity and conducted that part for 1-hour. Option 2 was conducted over three days.

Day 1: The class made the dough using the lesson's recipe to make the clay, but they left out the alum. The students made the dough, and Danielle gave oral directions to them. They made the dough in one big bowl for the whole class and doubled the recipe. Danielle and her teaching assistant made the maze bases with cardboard and wax paper, and drew where the students were supposed to put the dough using the model in the original lesson. It was difficult for the students to connect the dough to form the maze and they needed adult supervision for this part. Making the dough and mazes took approximately 1.5 hours.

Day 2: The students put glue on the mazes; this took about 30 minutes.

Day 3: The students put pollutants on their mazes; they used food coloring, salt, and sugar and dropped water through the mazes using an eyedropper. Everyone had his or her own maze, and each student waited one at a time to use the dropper. This way everyone had a chance to watch how their classmates' mazes changed. Students were able to handle the maze and the eyedropper themselves. For the first round Danielle filled the eyedroppers with water. For the following



Danielle's students negotiate the maze.



Michele assists her students in putting water on their mazes.

rounds the students filled the eyedroppers and used as much water as they wanted. Danielle noted that the students “made a mess, but they loved it.” They discussed who had more or less pollution left on their mazes and where it ended up. Some of the students used yellow instead of blue, and they discussed how some chemicals act differently than others in water. They compared the differences between everyone’s mazes. Danielle conducted this part for about 60 minutes.

Dave didn’t make any changes to the Option 1 steps. He and his students discussed throughout the activity what happens to materials that go into our water supply. He asked such questions as: How would you recycle oil? How does water clean things? Can treatment plants treat sewage 100%? What can you do to lessen the problem of water pollution? Dave conducted this activity for 80 minutes.

Evaluating the Activity

After the water ran through the maze, Michele’s class talked about pollution and its removal. Then they removed the “pollution” with tissues and sent water back through the maze without pollution to compare the results.

Danielle used discussion to assess the activity. The students also acted out the maze as part of the discus-

sion and showed how their own mazes worked. Each student explained how the water color changed (for Option 2) or why they had white powder or other “pollutants” on themselves from Option 1.

Dave used the assessment recommendations in the original lesson, except he did not have the students design a brochure.

Extensions

Michele did not conduct any at the time of the activity, but she plans to visit the treatment plant in town with her class.

Danielle’s students went home and discussed problems of runoff and pollution with their parents.

Dave had the students write a summary about what they learned from the activity.

Other Comments

Michele: “Heavier cardboard would be better to use to avoid leaks, but the leaks made the activity more realistic. This led to a discussion on “boil orders” and why we might have to boil water before we use it. If the surface was more sturdy it would be easier for a student like Lynn, who has spasms, to hold the maze herself.”

Danielle: “The kids really got this activity—I thought this was one they would have difficulty with, and they surprised me that they understood the idea of runoff. Although this was a difficult concept for some of the students, some really grasped it and did great. They were excited about the activity and shared their excitement with parents. They did not understand the concept of making brochures from the assessment suggestion. We had them tell parents the information. Now they take note of storm drains and were able to talk about the activity later on.”

Dave: “The weather was bad the day we conducted the activity, so we stayed in the classroom. This class did really well with the activity. The inclusion class followed the directions better than my other classes. It helps to have another adult in the room.”

“I liked putting the pollutants in the maze.”

Student in Michele Raker-Morris’ class

A-Maze-ing Water is adapted with permission from The Watercourse/Montana State University and the Council for Environmental Education from the Project WET Curriculum and Activity Guide. Copyright © 1995.

THE THICKET GAME

OBJECTIVES

Students will: 1) define adaptation in animals; and 2) generalize that all animals are adapted to survive.

METHOD

Students become "predator" and "prey" in a version of "hide and seek."

BACKGROUND

NOTE: See "Seeing is Believing" and "Surprise Terrarium" for other elementary-age adaptation activities.

Animals are adapted to their environment in order to survive. Animals may be adapted to changes in their habitats. For example, snowshoe rabbits have a white winter coat to blend with a snowy environment and a tan summer coat to blend with summer ground and vegetation colors. Chameleons change color to blend with their surroundings. The walking-stick insect can look like a twig or stick. Fawns have spotted hair that resembles dappled light on the forest floor.

The major purpose of this activity is for students to understand the importance of adaptation to animals.

MATERIALS

blindfolds; outdoor area like a thicket or other vegetated area free of poisonous plants and other hazards where students can safely hide

Age: Grades K-6

Subjects: Science, Physical Education, Language Arts

Skills: Analysis, application, description, discussion, generalization, kinesthetic concept development, observation, psychomotor development

Duration: 30 minutes

Group Size: minimum of five students

Setting: outdoors

Conceptual Framework Reference: III.D., III.D.1., III.D.2.

Key Vocabulary: adaptation, predator, prey

Appendices: Outdoors, Field Ethics, Simulations

PROCEDURE

1. Take the class to a "thicket."
2. Blindfold one student who will be the "predator." The predator slowly counts to 20 while the other students or "prey" hide. Hiding students must be able to see some part of the predator at all times.
3. After counting, the predator removes the blindfold and looks for prey. The predator can turn around, squat and stand on tip-toe but not walk or change location. The predator should see how many students he or she can find, identify them out loud and describe where they are. When identified, the prey come to the predator's location and wait until the next round to become predators but do not tell the original predator where anyone else is hiding.
4. When the original predator cannot see any more students, a new round starts. All of the predators put on blindfolds. Predators should be in close proximity to each other. Each predator has the same motion restrictions that the original predator had. The original predator again counts aloud to 20. All the remaining prey must move at least ten feet closer to the predators. Those remaining prey still try to remain hidden. All the predators remove their blindfolds and take turns naming students they can see.
5. Play as many rounds as necessary until only one or two students are left hidden. At that time, have the remaining students stand up and identify themselves. It may be surprising how close the prey got to the predators without being detected. Both the ability to remain undetected and to detect others are examples of successful adaptations. Introduce the term "adaptation."
6. Do the activity one or two more times.
7. Discuss what made predators and prey successful. Were they quiet, clever, camouflaged, or good listeners? Ask students to identify animals that are adapted with similar characteristics to survive.

8. Ask the students how they could change to be more successful predators and prey. Some ideas that may come out are: changing color (clothes); wearing clothing that doesn't stick to plants; being smaller; climbing a tree. Ask the students if animals can make any similar kinds of changes.
9. Talk about differences between physical and behavioral changes. Have the students identify which survival and adaptations related to predators and prey are behavioral, which are physical and which involve both. Explain that physical and behavioral adaptations take time.
10. Ask students to summarize what they have learned. See if students can think of other examples of animal adaptations. Generalize that all animals are adapted to survive.

AQUATIC EXTENSIONS

1. It is not just animals on land that are adapted for survival in a variety of ways! Imagine an underwater thicket. What would be the same, if anything, about predator and prey relationships in an underwater thicket? What would be different, if anything? Draw two different underwater thickets—one in a pond and one in an ocean. Include pictures of fish and other aquatic life that are hardly visible because of adaptations that make them hard to see and pictures of others that are easy to see.
2. Identify predators and prey in two or more aquatic environments.

EVALUATION

1. Describe the importance of adaptation to animals. Give at least two examples of animal adaptation.
2. Create a play or skit that shows how both predators and prey are adapted to survive.



The Thicket Game

Michele Raker-Morris' and Danielle Whitcomb's classes together

Students with multiple disabilities; students with developmental disabilities

Michele's Lead-up Activities conducted Oct. 17

Danielle's Lead-up Activities conducted Oct. 17, 18

Main Activity conducted Oct. 19

Location: In wooded area at Recreation Unlimited

Dave Fitzgerald's class

Students with learning, behavioral, and developmental disabilities in an inclusive science class

Lead-up Activity conducted Oct. 19

Main Activity conducted Oct. 20

Location: In woods behind school

Adaptations and Modifications Implemented for Each Factor

Presentation Methods

Michele used sign language for Eileen to explain the rules of the activity to her. Danielle and Michele gave students examples of how to hide; modeled the idea of moving closer and hiding again for each round of the game.

No changes were needed for Dave's class.

Lead-up Activities

Michele introduced the concept of camouflage by bringing in magazines and pictures; the class talked about animals and hunters hiding. Students had to find pictures of camouflaged animals and hunters. This activity was conducted for 45 minutes.

Another lead-up activity consisted of the students having to camouflage their own "worms." Michele took a piece of orange construction paper and a piece of black construction paper and put an orange pipe cleaner on both of them. She told students to pretend the pipe cleaner was a worm, and discussed which one was easier to see, and why it was easier to see. She gave each student their own worm, either a brown, green, or white one, and they had to camouflage the worm by using things in the classroom, or they could go outside the room and bring back things that would camouflage the worm. Each student had a chance to hide his or her worm in the classroom using the idea of camouflage, and the others students had to find it. This activity was conducted for an hour.

Danielle discussed how camouflage works and what it's for using pictures of animals. She did this for two days for a total of about 30 minutes before conducting the activity. She also held a discussion right before doing the activity as a review of the concept of camouflage.

Dave and his students discussed predators and prey, and how camouflage and protective coloration helps animals.

Physical Environment

Michele and Danielle chose a setting that had both open and sheltered areas. The setting was a typical woodland habitat.

Dave used a wooded area behind the school.

Material Adaptations

Michele and Danielle didn't need to change the equipment. They made sure that the predator would be more visible and could be seen by the prey by having that student put on a white shirt.

Dave used a blindfold as suggested in original activity.

Procedural/Rule Adaptations

Before beginning the activity Michele and Danielle modeled the concept of "closer" and how to move



Michele's and Danielle's students that were "captured" have now become a group of predators. They close their eyes as prey hide in the woods.

closer after each round of the game. As prey were identified, they would become another predator so no one was excluded from the activity. The teachers also gave as much time as needed for prey to hide. Instead of counting to 20 the predator hid his or her eyes and waited until the adults couldn't see any more movement. Students in wheelchairs and those with other mobility problems needed help moving to their hiding places, and teachers and assistants helped move prey as needed.

Dave had the predator turn as he counted and point towards the direction he wanted to "hunt" based on what sounds he heard coming from a particular direction. Dave let the predator decide which way he would face, since he wouldn't be able to move his feet at all to change his direction after counting. Dave's class conducted this activity for about five or six rounds with different students taking turns being the predator. As prey were found Dave would let another person be the predator.

Break Activity into Tasks

Michele and Danielle held a group introductory discussion at the beginning in an indoor area to keep the students' attention focused. Directions were given at the site of the activity. The game was played for three rounds, then would begin again. At the conclusion of the activity, the teachers and students discussed what made predators and prey successful, and dis-

cussed other questions similar to suggestions 7–10 from the original lesson. The entire activity (introduction, activity, discussion at conclusion) was conducted for 1.5 hours.

Dave discussed between changes of predator that the prey should be quiet and motionless. The prey that were caught discussed how they were camouflaged. The first predator could only find four prey the first round and eight the next. As prey were found Dave let another person be the predator. Dave would repeat directions that the prey must be able to see some part of the predator at all times. He conducted this activity for 80 minutes.

Evaluating the Activity

Michele and Danielle's students talked about the importance of animal adaptations and how animals use adaptations. They also discussed how animals choose their habitats. The groups did not create a play or skit.

Dave asked students to describe the importance of adaptation to animals.

Extensions

Michele's class used the pictures of camouflage examples, including fish, to discuss what made it difficult to find the animals and hunters.

Danielle and her students looked at more examples of camouflage using pictures and how it helps animals survive.

Other Comments

Michele: "Great activity for my group! My kids want to do this activity all the time, and I think they got a lot out of it. In general, it's important to do different types of lead-up activities."

Danielle: "This activity is easily adapted for a wide range of disabilities, it's an easy-to-understand concept—you can come back to it, the kids don't get bored with it, and they get to be up and moving."

Dave: "It's a really good activity that kids of all abilities can take part in."

After the classes completed field-testing the activities, Karen Ricker interviewed the teachers and their assistants to get their impressions about conducting the activities, inclusion ideas, and how these activities related to their curriculum goals.

Other Considerations: A Conversation with the Middle School Teachers*

Danielle Whitcomb (teaches students with developmental disabilities)

Patti Ranelli (assists Danielle with her students)

Dave Fitzgerald (teaches an inclusive science class that include students with learning disabilities)

Marsha Matheney (assists Dave with his students)

Michele Raker-Morris (teaches students with multiple disabilities)

Toni Keckstein (assists Michele with her students)

What surprises did you encounter in terms of what the students learned and how they responded to the activities?

Danielle: I was surprised at how well they understood “A-maze-ing Water,” and then they had difficulty understanding “Pass the Plants, Please.” They enjoyed doing the activities, it was something different, especially for the kids that I’ve had for two years now. Oliver’s mom told me that when he came home with his maze he ran water through it and demonstrated it for his parents.

Patti: It was great how into the activities they all were, how excited they were about learning—I thought there would be more groaning. Doing the activities made me more aware of what the kids were able to retain. Even a month later the students would mention a comment related to the water activity.

Dave: Things went much better than we anticipated. The expressions on the kids faces, you see some of them just light up. The students understood the concepts.

Marsha: I was surprised at how well “The Thicket Game” went, the kids really enjoyed learning outside. They enjoyed the discussions too. Some of them had a lot to say about pollution, and runoff and where pollution comes from.

Michele: I don’t know if I expected them to understand the concepts, and I was surprised that they all seemed to grasp the idea of “A-maze-ing Water,” which I thought would be harder for them to understand.

Toni: With “A-maze-ing Water,” Alan made it so polluted, then when he saw that the water needed to go down, he said, “Oh why did I do that,” and he saw that we don’t want those things in our water. During “The Thicket Game”—even though Joshua was wearing red, he knew how to keep real quiet, and stay still and make himself as small as possible. Even with the “Pass the Plants, Please” the kids didn’t even realize before doing the activity how much we eat that comes from plants.

What advice would you give to other teachers who want to conduct environmental education activities with students who have disabilities?

Danielle: I would advise doing lead up activities before doing the lessons, because it helped the students get ready for the lesson and understand. Really lead up to the activity well, and in small bursts—use repetition so that they get the activity. Think of ideas, and go to other people in the building for help if needed. Give it a try; you’ll be surprised at what the kids do retain.

Dave: It depends on the students in your class. In our situation we could just carry out the activities without having to really modify at all.

Michele: Just do it. It wasn’t as hard as I thought it would be. You can fit the activities into anything you’re doing. Now the kids are real willing to do these activities—they like it—they enjoy doing them.

Toni: You have to break things down, take it step-by-step. Sit back and let the students go with it. Let the

kids try things and to see things for themselves. They learn so well with a hands-on process.

In what ways would you use these activities with inclusive groups?

Danielle: I would make sure that the kids do preliminary activities together, and not put them together cold turkey. You need to spend time helping to build social relationships before being involved with a learning activity. Do team-building activities beforehand.

Michele: I think I could use them with any group. I would team kids up into small groups, two or three students from a regular education class with one of my students. Small groups would keep everyone involved. Give everyone a role.

In what ways were these activities able to meet the educational requirements of your students in terms of their Individualized Education Program (IEP) or your curriculum?

Danielle: “The Thicket Game” was good for gross motor skills and social skills—these skills are included on all their IEPs. It also related to units on animals that we do. You can tie most of the activities into what we do in school. “Pass the Plants, Please” tied in with our unit on foods. All of the activities included following directions, staying on task and that’s included in all their IEPs. We usually teach how to go to the grocery store, how to buy things, use money, health related things, how their bodies work, math methods such as using money, making change, some problem solving. Everything we do is in the context of life skills.

Dave: “A-maze-ing Water” related to the water cycle; “The Thicket Game” tied in with learning about animal survival; “Pass the Plants, Please” got the kids to understand the parts of the plants and what’s edible. Depending what you’re teaching, there’s environmental education activities you can relate to any topic.

Michele: On everyone’s IEPs I have as a goal that the students will become involved with the environment around them, but I never had it so hands-on before. “Pass the Plants, Please” fit into my health and nutrition goals, it also fit into their reading goals for all except Danny. “A-maze-ing Water,” fit into math skills with the measuring of the dough ingredients and into the reading and language arts goals of following step

directions. All three activities related to their behavioral goals of getting along and working with others.

Do you plan to continue using these activities or other environmental education activities this year and next? If no, why not?

Danielle: Yes, we’ve used others from the activity guides. I enjoy them, and so do the students.

Dave: Yes.

Michele: Yes, I’ve done others already. We try to do one a week. We choose one activity that we can do over a whole week, that we can start on a Monday, so that by Friday they have a finished project and a new concept that they understand. The kids love it, and it gives us a change.

Is there anything else you want to say about your experience with conducting these activities?

Danielle: The hardest part for me was to try to find a place to fit them in, especially when there’s so many things that need to be done. I don’t think there were too many things asked, but the activities took a lot longer than I expected. And you didn’t know that until you got into it. You ask yourself “Do you feel that these activities were worth your time with these students?” There’s two ways to answer that. If you’re talking about are they going to use this stuff when they leave this classroom—no, not likely. But do I teach everything based on if they will use it outside the classroom—no. I still feel there’s space for them to learn other things, and if I can give them the majority of one, and get some kind of balance by adding something extra and special, I find that really wakes up the kids who understand what’s going on. My higher-level students thoroughly enjoyed it and loved every minute of each activity whether they got it or not, they just loved doing something different from our standard routine. But then those kids who are so used to my standard routine were just shaken up—“why are we not doing our job stations now, why are we not doing that?” It was worthwhile for me to see some of the students really getting a lot out of it. It’s worthwhile in terms of them doing something different from their regular routine, and being able to deal with a new experience.

Dave: For the kids I have this year, I really didn’t have to change anything with the activities. The stu-

dents with learning disabilities are part of the class, and they need to meet the same expectations. Some of the kids with learning disabilities do better than the regular education students because they are getting the extra help from Marsha, as far as studying and reviewing information. So they don't really do any worse than the regular education students. Marsha helps anyone who asks for help or who raises their hand. The students she works with may tend to go to her first if they have a question. I think the class knows why she's in here, but they're not sure which students have disabilities. The kids aren't stigmatized as being "Marsha's kids."

Marsha: For example, when it's test time, I just nod my head to show it's time to go outside the room so I can read the test to them. At different times Dave has asked the class "Does anyone want Mrs. Matheney to

read the test to them" so the class does know why some of the kids are leaving the room, and now there's about 75% of the class that wants to go with me!

Dave: Having Marsha read the tests and directions to the kids is an adaptation, but a lot of the regular education kids go with her too, as many as she can handle. So the inclusion works both ways—kids with learning disabilities in the regular science class, and kids without learning disabilities included with the students [with learning disabilities] for test taking options. We try not to make any of the students feel singled out.

**Based on separate interviews with each teacher. Danielle and Patti were interviewed together; Michele and Toni were interviewed together; and Dave and Marsha were also interviewed together. The "conversation" printed here has been edited for clarity. Student names have been changed to maintain confidentiality.*

High School Teachers



Irene Stephens and Rita Hinz, Beechcroft High School
Teach students with physical disabilities

Dora d'Amato, Olentangy High School
Teaches students with developmental and behavioral disabilities

Rita Treese, Olentangy High School
Teaches students with multiple disabilities



Irene Stephens and Rita Hinz's Class

Irene Stephens and Rita Hinz teach students with physical disabilities at Beechcroft High School in Columbus, Ohio. The school is located in an urban area. Irene is in her early 60's and has been teaching for 35 years, all in special education. She holds bachelor's and master's degrees in special education. Irene also has supervisory certification and is certified to teach regular education students in grades K-8. Irene teaches such subjects as vocational/career awareness, life management, functional life skills, and works with students in regular education inclusion classes. Rita is in her mid-40's and has been teaching for 15 years, all in special education. She has her bachelor's degree in special education and is currently working on her master's degree in the same area. Rita is also certified to teach computer science. She teaches government/social studies, general science, computer technology, and functional life skills.

Irene and Rita have a total of 24 students: 16 boys and eight girls ages 16 to 20 in grades 9 to 12.* They brought their classes together to field-test the activities. All of the students are physically disabled and most use wheelchairs. Twelve students have cerebral palsy (CP) to varying degrees: Carlos and Bill use manual wheelchairs and can talk without any problems. Kim and Ed use manual chairs, and have slow, impeded speech; Cindy has ataxic CP and is able to walk; she also has a hearing impairment. A few of the students with CP are quadriplegics and non-verbal, and use motorized (electric) wheelchairs with electronic communication boards that have simulated speech. Several students have spina bifida and use manual wheelchairs. Three students use wheelchairs due to traumatic brain injuries from car accidents. Others have medically-related physical disabilities: Pat had a brain tumor, has poor balance and is hearing impaired. Keith had a stroke, is non-verbal, uses a power wheelchair and a feeding tube. Some students

use urine bags, and others have mobility problems from muscular dystrophy or hemiplegia (weakness on one side of the body).

Most of the students switch classes, as in any other high school for each block period. There are four blocks in the school day and each block is a different setting and subject. A few students do stay with Irene or Rita the entire day in a self-contained setting. In addition, most of the students receive physical and occupational therapy, adapted physical education, and some students receive speech therapy. All therapies are provided by the school district.

When conducting activities, Irene and Rita usually divide students into groups and put those with language abilities together with those who have language difficulties, or are non-verbal. Each group would also include a student who can talk and someone who can write. Most of the students can communicate well with each other—they work with each other regularly, and it's not unique for them to engage in cooperative learning. Students with communication devices can spell out words, or their teachers or peers can give them choices of responses.

Dora d'Amato's Class

Dora d'Amato teaches students with developmental and behavioral disabilities at Olentangy High School in Lewis Center, Ohio. The school is located in a rural/suburban area. Dora is in her mid-30's and has been teaching for 13 years, all in special education. She has a bachelor's degree in special education.

Dora has nine students: seven boys and two girls ages 16 to 18 in tenth and eleventh grade.* Seven students have developmental disabilities; their IQ scores are between 50 to 80 and they have low reading and writing skills (an IQ score of 100 is considered the norm). Richard and Linda are classified as severely behaviorally disabled and have difficulty following

rules, listening, following directions, and are obstinate. Doug has learning disabilities and has an average IQ but has reading problems. Five students receive speech therapy services provided by the school district. Dora's students stay with her for the school day. Students leave her class for lunch, physical education, home economics, and woodshop which they attend in an inclusive setting with other students.

Rita Treese's Class

Rita Treese teaches students with multiple disabilities at Olentangy High School in Lewis Center, Ohio. The school is located in a rural/suburban area. Rita is in her early 40's and has been teaching for 19 years, all in special education. She has her bachelor's degree in elementary education and is certified to teach students with moderate to profound developmental disabilities.

Rita has eight students: four boys and four girls ages 14 to 17 in grades 9 to 12.* All of Rita's students

are developmentally disabled and have some other type of disability. Their IQ scores are between 50 to 80. In general Rita's students have language delays, and low reading and writing skills. Zach is a non-reader. Amanda also has difficulty walking and in visual focusing. Stuart and Kyle have severe behavioral problems: Stuart is hyperactive and has outbursts; Kyle has been physically violent. Ray also has behavior problems and Jill has low gross motor skills, visual perception difficulties, and at times exhibits bizarre behavior. Six students receive speech therapy and two receive physical therapy services provided by the school district. Rita's students stay with her for the majority of the school day. Students leave her class for lunch, physical education, home economics, and woodshop which they attend in an inclusive setting with other students.

**All students' names have been changed to maintain confidentiality.*

Activities Field-Tested with the High School Students

Dynamic Duos (Project Learning Tree)

Raining Cats and Dogs (Project WET)

Wildwork (Project WILD)

Why were these activities selected?

Dynamic Duos

- The idea of working together and depending on others related to the philosophy of the school which emphasizes working together cooperatively.
- The idea of interdependencies related to the students—some of them really depend on other people to help them use the restroom, eat, and dress. They compared their situation to the relationships that animals have with each other or with plants.
- The activity could be used for vocabulary enrichment.

Raining Cats and Dogs

- The activity related to the speech curriculum and expressions used when speaking.
- It related to goals of problem solving and vocabulary enrichment.
- The activity increased students' understanding of proverbs and figures of speech.
- Students had the opportunity to use brainstorming techniques and critical thinking skills.

Wildwork

- The activity was occupation and career oriented.
- It would create new awareness of careers related to wildlife.
- Wildwork related to our functional curriculum because it's about careers, and that's something we're very interested in at the high school level.

Overview

Organisms in an ecosystem depend on each other for food. But they may also depend on each other for protection, transportation, or shelter. A close, long-term relationship between two organisms is called *symbiosis* (sihm-bee-OH-sihs). In this activity, students will learn about several kinds of symbiosis.

Background

Many plants and animals have evolved *symbiotic* relationships. Sometimes these relationships are *mutualistic* (both species benefit). For example, many birds, insects, and bats get food by drinking nectar from flowers and, in the process, pollinate the flowers. Some fish get their meals by cleaning parasites from other fish. Many birds and mammals disperse plant seeds by eating the plant's fruit and excreting the seeds later.

Some relationships are defined as *commensal* (kuh-MEN-suhl) (one partner benefits, while the other is seemingly unaffected). For example, some frogs in rainforests carry their young to water-filled plants named bromeliads (bro-MEE-lee-ads) that grow attached to the trunks and branches of trees. The tadpoles get a safe place to develop but the bromeliad doesn't seem to be harmed by this use. Some moths feed on the tears of cattle and other animals without affecting them.

In *parasitic* relationships, one partner benefits but the other is negatively affected. For example, fleas and ticks suck blood from their hosts, but the hosts suffer itching and may also contract diseases from those parasites. Cuckoo birds lay their eggs in the nests of other birds. When they hatch, cuckoo chicks push the other chicks out of the nest and the host birds raise the young cuckoos as if those chicks were their own.

Getting Ready

Make copies of student pages 81 and 82, and bring in help-wanted ads from newspapers.

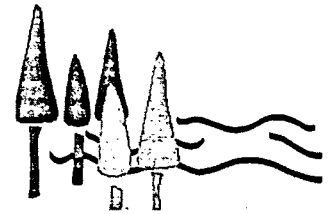
Doing the Activity

1. Start by asking the students to name some ways that we depend on plants. (Food, building material.) What are some things we do to support and maintain plants that are important to us? (Agriculture, forestry.) How do other animals depend on plants? (Food, shelter.) How do plants depend on animals? (Pollination, seed dispersal.) Explain that students will discover more about the ways some plants and animals help each other to survive.

2. Pass out copies of student page 81 titled "Classified Ads." Explain that the top portion of the student page represents fictitious want ads in a newspaper. (Show students where the want ad section is in the local paper, and read a few ads so they understand the concept.) At the bottom of the student page is information about several different animals or plants. The students should decide which animal or plant described at the bottom of the page would be likely to respond to each ad.

3. When the students are finished, go over the page using the answers on page 80 and the Background information. As you review each ad, ask students to describe what each partner gets from the relationship.

4. Ask students to describe other symbiotic relationships they know of. Do they know any other examples where both partners benefit? (Mutualism: see Background.) Do they know of partnerships in which one partner benefits and the other is unaffected? (Commensalism: see



LEVELS

Grades 5-8

SUBJECTS

Science, Language Arts

CONCEPT

- Organisms are interdependent; they all depend on nonliving components of the Earth. (4.1)

SKILLS

Analyzing, Reasoning

OBJECTIVES

Students will ① examine close relationships that exist between different organisms and ② explain how partners in these relationships help each other to survive.

MATERIALS

copies of student pages 81 and 82, pencils and paper, want ads from the local newspaper (optional)

TIME CONSIDERATIONS

Preparation: 20 minutes

Activity: 50 minutes

Background.) Do they know of partnerships in which one partner benefits and the other suffers? (Parasitism: see Background.)

Enrichment

Pass out copies of student page 82 titled "Relationships," and go over the page with students. Have them identify what, if anything, each partner gets from the relationship. Use each example as a springboard for further discussion and as an introduction for local examples.

END NOTES...

ASSESSMENT OPPORTUNITY

Have the students think of (or research) a symbiotic relationship other than the ones described in the activity (preferably a local example), and write a newspaper-style want ad from the point of view of one or both of the partners.

RELATED ACTIVITIES

Charting Diversity, Can It Be Real?, Picture This!, Habitat Pen Pals

ANSWERS

A. Flora (*Angraecum* orchid) & 2 (hawk moth). Many plants rely on animals to pollinate their flowers. In some cases, plants depend on specific animals to pollinate them, and the animals are specially adapted to pollinate only those plants. The Madagascan hawk moth and the *Angraecum* orchid are an excellent example of this type of specialization. The moth, with its 12-inch (30.5-cm) feeding tube, is the only animal in the Madagascan forest that can reach the flower's nectar supply.

B. Acacia (uh-KAY-shuh) (bull's horn acacia) & 5 (*Pseudomyrmex* ant). Hollow thorns on acacia trees provide excellent places for ants to live and raise their young. For the adult ants, the trees provide food in the form of nectaries inside their stems. At the tips of their leaves, they also produce protein-rich food that the ants feed to their young. The ants, in turn, defend the tree against potential foes. They attack and chase away any insect that lands on the tree, cut down competing plants, and may even attack large, browsing mammals.

C. Mimosa (mee-MOH-sah) & 1 (*Mimosa* girdler beetle). *Mimosa* girdler beetles will lay their eggs only on mimosa trees. Mimosa trees usually live for about 20 years. However, trees that have been "girdled" by the beetles may live twice as long (the reason is not yet known).

D. Melly Ratel (RAD-uhl) (honey badgers) & 3 (honey guide). Ratels, or honey badgers, eat many different foods, including small mammals, birds, dead animals, and plants. If a ratel hears a honey guide making characteristic calls, it will follow the bird—and the bird will lead it to a beehive. Once the ratel has broken open the hive, it will eat the honey and the bees; the bird will eat the bee larvae and wax in the hive. Honey guides also lead people to bee hives.

E. Mr. Pits (fruit tree) & 4 (flying fox). Flying foxes are active at night and may fly long distances from their roosting trees to the trees where they feed. Once flying foxes have found trees laden with fruit, they will eat, rest, and digest their food before flying home. These large bats are important seed dispersers for many different fruit-bearing trees.

CLASSIFIED ADS

A

Pollen mover needed. Will give sweet, energy-packed nectar in exchange for carrying pollen to other flowers. Must bring a long tube to reach the nectar. Call Flora, 555-9377.

B

Desperately need protection from insects and climbing vines. Will provide protein-rich food for your young, a safe home, and nectar in exchange for guard duties. Call Acacia, 555-8733.

C

Pruning helps me live longer. Can provide safe area for your young to develop in exchange for cutting off the ends of my branches. Call Mimosa, 555-6672.

D

Extremely strong individual seeks partner to help locate nests of wild bees. Will rip open nests and share the contents in exchange for guide services. Call Melly Ratel, 555-2473.

E

Seeking individual to spread seeds around the forest. Offering juicy fruit in exchange for delivery services. Call Mr. Pits, 555-1234.

CRITTERS

1

My eggs can hatch only in dead wood. I lay my eggs in the end of a tree branch. Then I cut through the bark all the way around the branch. This kills the end of the branch and my eggs have all the dead wood they need.

2

I'm active at night and feed using a straw-like tube that I can coil up like a hose. Uncoiled, my feeding tube may be 12 inches (30.5 cm) long.

3

I love to eat honey and beeswax. I can easily spot the beehives that are full of these delights, but I have no way to open the nests.

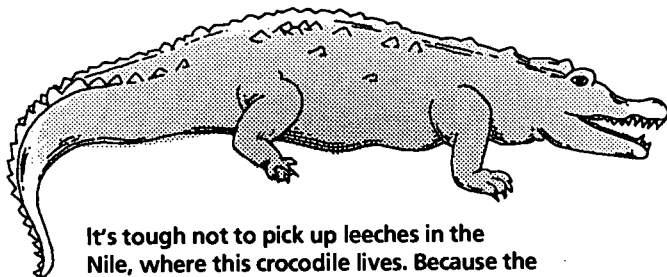
4

I can eat twice my weight in fruit every night. I chew the fruit, suck out the juices, and then spit out the pulp and seeds.

5

I live in a colony, and all of the members of my colony share the jobs. We take care of the young, collect food, take care of the queen, and defend our nest.

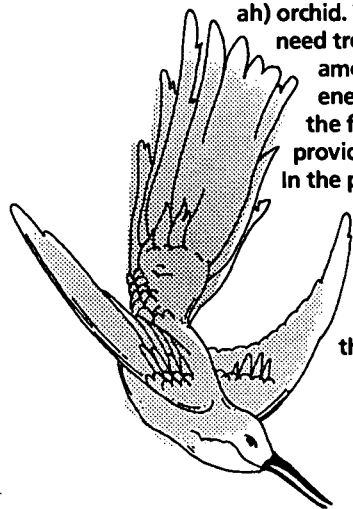
RELATIONSHIPS



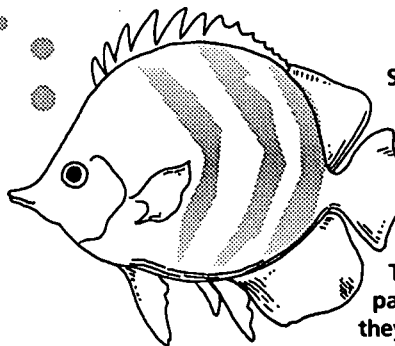
It's tough not to pick up leeches in the Nile, where this crocodile lives. Because the crocodile's skin is so tough, leeches usually attach themselves to the soft areas in the reptile's mouth. Birds called Egyptian plovers (PLUHV-uhrs) hop in and out of the crocodiles' mouths, making meals of the leeches and any food that's stuck between the crocodile's teeth.



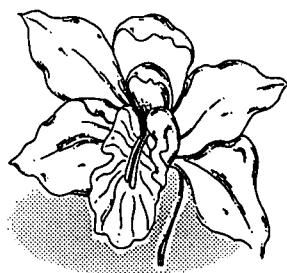
These ants live in the hollow root balls of certain plants called epiphytes (EP-uh-fights). The hollow balls provide a protected nest for the ants. And the material that the ants carry into their nests creates a great nutrient-rich compost for the epiphytes.



Only a swordbilled hummingbird can drink the nectar of the Passiflora (PASS-ee-floor-ah) orchid. The birds need tremendous amounts of energy, which the flower provides. In the process of getting a meal, the birds pollinate the flowers.



Some rain forest trees rely on very unlikely animals to disperse their seeds: fish! During certain times of the year, the Amazon River floods. Then fish swim into parts of the forest that they can reach only during flood season. As fruit falls from the trees into the water, the fish eat it. Later, they excrete the seeds in another area.



By trapping insects, plants like this bucket orchid get pollinated. Perfume lures bees to the flowers. When the bees crawl inside the flowers, they fall into a pool of liquid. By crawling out a special "side door," the bees save themselves from drowning. In this process, they become coated with pollen, which they carry to the next orchid they visit.

Dynamic Duos

Irene Stephens and Rita Hinz's class

Students with physical disabilities

Main Activity conducted Oct. 2–5; 10–12

Location: Outside, in classroom, in school library, in hall

Dora d'Amato's and Rita Treese's classes together

Students with developmental and behavioral disabilities; students with multiple disabilities

Main Activity conducted Nov. 17

Location: In classroom

Adaptations and Modifications Implemented for Each Factor

Presentation Methods

Irene and Rita H. reviewed the concepts frequently for the students' benefit. Each day they conducted this activity they would review the vocabulary. Vocabulary was presented visually on a chart. One vocabulary exercise involved putting the words on the chart and handing out the definitions to the students, and they had to match the definition with the right word. The teachers charted the vocabulary, had students look up the definitions in the dictionary, gave students oral scenarios and the students had to choose the correct vocabulary word (mutualistic, commensal, parasitic). Irene and Rita also did choral responding where the class would repeat the words aloud after them.

Dora and Rita T. listed on the board ways animals and plants depend on each other. Making a large chart on the board helped visual learners and focused the students' attention on the discussion

Lead-up Activities

Neither group did any specific lead-up activities.

Physical Environment

Irene and Rita H. moved to a larger room to accommodate many students in wheelchairs and some regular education students. Four regular education students joined the class for all the activities and assisted the students. Students divided into groups to work on the classified ads page; groups worked in the classroom, library, and hall.

Dora and Rita T. used the classroom and moved tables out of the way so there would be no obstacles.

Material Adaptations

Irene and Rita H. used real newspaper ads with this activity. They also turned the enrichment activity into a game using the animals and descriptions from the Relationship page (see Extensions).

Dora and Rita T. cut out each description and critter from the student page to create an interactive matching game using each part of the ad page (see Procedural/Rule Adaptations).

Procedural/Rule Adaptations

Irene and Rita H. copied the Classified Ads and Relationship pages for each student. Ads were read out loud to the class, and were rephrased and explained as needed. They introduced the activity by talking about human relationships and discussing how we are all interdependent, what animals we depend on, and what plants we depend on. The class looked at ads in the paper and talked about the relationship between the employer placing the ad and the person responding.

Instead of giving each student a copy of the whole Classified Ads student page, Dora and Rita T. cut out each description and critter to create an interactive matching game using each part of the ad page. The descriptions and critters were cut apart and handed

out to pairs or small groups of students. There was a total of 10 groups: descriptions A, B, C, D, E and critters 1, 2, 3, 4, 5. Students mingled throughout the classroom trying to find the group that matched their ad or critter.

Break Activity into Tasks

Irene and Rita H. conducted this activity for seven days over a 2-week period. Each session was about 20 to 30 minutes long unless noted otherwise.

Day 1: The teachers introduced the activity. The class went outside and looked for examples of symbiotic relationships around the school grounds.

Day 2: The class discussed human relationships and the idea of interdependency; gave examples of who and what people depend on.

Day 3: The teachers introduced specific vocabulary and related vocabulary to people, plants, and animal interdependencies.

Day 4: The class reviewed vocabulary and gave examples of mutualistic, commensal, or parasitic relationships.

Day 5: Students divided into groups to work on the classified ads page. Students were grouped heterogeneously: those with language abilities were together with those who had language difficulties, or were non-verbal; readers with non-readers. The regular education students were mixed in with the groups too. Students worked on the ads, and made their decisions as a group. Then the groups got together as a class and compared the information. This activity was conducted for 1 hour to make sure that each group had enough time to complete the ad page.

Day 6: The Relationship Enrichment activity was conducted.

Day 7: The teachers read and discussed with students an article on bats from local newspaper that focused on symbiotic relationships. Students took turns reading the article out loud.

Dora and Rita T. conducted this activity in a 1-hour session. They discussed the following with the class:

1. How people depend on plants.
2. How plants depend on people.
3. How animals depend on plants.
4. How animals depend on animals.
5. Employee/employer dependencies.
6. The students completed the classified ad activity/game.
7. The class discussed the activity and main concepts.
8. The students summarized the activity and related the concept to their own lives.

Evaluating the Activity

Irene and Rita H. used a newspaper article called "More about Bats" as a follow-up and assessment of general knowledge. They also gave students a test and asked the following questions; students had to circle the correct response:

1. A relationship where one partner benefits and the other is hurt:
commensal parasitic
2. A relationship where one partner benefits and the other is unaffected:
commensal mutualistic
3. A relationship where both partners benefit:
parasitic mutualistic
4. All living things depend on each other:
yes no
5. Bees get food from a flower and the flower is pollinated:
parasitic mutualistic
6. Ticks suck blood from a dog and the dog gets sick:
parasitic commensal
7. Birds eat berries and then drop the seeds that grow new plants:
mutualistic commensal
8. Some vines such as Spanish moss grow up trees but do not hurt the trees:
parasitic commensal
9. Most animals depend on plants for food, shelter:
yes no
10. How many things are in a duo:
1 2 3 4
11. When many kinds of animals and plants get along together this is called symbiosis:
yes no
12. A cuckoo bird lays its eggs in another bird's nest and when they hatch the cuckoo chicks push the other baby birds out of the nest. This is an example of what kind of relationship?
mutualistic parasitic
13. Some ants live and raise their young on the thorns of acacia trees. The ants protect the tree. What kind of relationship is this?
commensal mutualistic
14. All plants and animals are interrelated with other plants and animals in some way:
yes no

Dora and Rita T. used observation to evaluate the activity. They determined whether the students actively participated and grasped the information and concept.



Dora's and Rita T.'s students make a game out of "Dynamic Duos."

Extensions

Irene and Rita H. played the Relationship page enrichment activity as a game. Sets of three students had to make an animal together and the other groups guessed which animal they made. For example, if the group had to make an elephant, they would act out the different parts of an elephant, such as ears on each

side, and a trunk in the middle. They had to decide as a team how to make the animal. Irene and Rita H. gave them examples, and modeled ways to make the animal. The students weren't allowed to make animal noises. The visually impaired students could see well enough to play the game. Students used the animals from the Relationship page. The teachers also related this game to the concept of the lesson. They conducted this activity for about 20 minutes.

Other Comments

Irene: "It was fun. The kids started to use the language in other places, in other classes, and began to hear it in other places and settings, and they mentioned it—that in itself was interesting. They picked up on the idea of interdependence in other subjects, like social studies, government, and science."

Dora: "It went very well, no problems. The kids really had a good time with this activity, and we felt like we were really 'on' with it."

"I feel the activities give you something new. You don't know what surprises you'll come to—you have to take a chance."

Student in Dora d'Amato's and Rita Treese's class

Raining Cats and Dogs



■ **Grade Level:**
Upper Elementary, Middle School

■ **Subject Areas:**
Language Arts, Culture, Ecology

■ **Duration:**
Preparation time:
Part I: 15 minutes
Part II: 15 minutes

Activity time:
Part I: 50 minutes
Part II: 30 minutes

■ **Setting:** Classroom

■ **Skills:**
Gathering information (listening); Organizing (matching); Analyzing (identifying); Relationships and components (discussing)

■ **Charting the Course**
This is an excellent introduction to any activity exploring various cultures and their relationships with water. "The Rainstick" could follow this activity, and "Piece It Together" would complement it with emphasis on the three climate zones and desert ecosystems.

■ **Vocabulary**
proverbs

If someone told you that it was "raining cats and dogs," would you call the Humane Society or don a raincoat?

Summary

Students analyze and interpret water sayings—through a card game, skits, pantomime, and creative writing—to compare figures of speech across cultures and climate zones.

Objectives

Students will:

- distinguish between figurative and literal translations of various water sayings.
- analyze water-related sayings of diverse cultures.

Materials

- *Copies of Water Sayings, Water Illustrations, and Water Scenarios* (Cut cards into squares. Cards may be glued onto cardboard and laminated for durability.)
- *Copies of Water Sayings From Around the World*
- *Bartlett's Familiar Quotations* (optional)

Making Connections

Through conversation and literature, students encounter sayings related to water. Although the origins of the sayings may not be known, students may have a regional or cultural understanding of their meanings. Students may broaden their understanding of regional and cultural perspectives and practices related to water by studying water-related proverbs.

Background

Sayings, proverbs, or adages exist in all cultures. They express the beliefs, values,

and lifestyles of the people. Although proverbs are common to all cultures, their expression and interpretation are unique. Proverbs are rich in tradition; they are generally passed from generation to generation and often represent the collective wisdom of a culture.

In Africa, proverbs are used for debate, storytelling, and daily conversation. In fact, in Africa it is said that talking without using proverbs is "like going on a journey without rice in your bag."

Because we are all dependent on water, proverbs related to observations about water pervade all cultures. The interpretation of a proverb often reflects ideas about how a person should live within that culture.

In some African cultures, for example, these water proverbs apply to knowing one's place:

"Even if you sit on the bottom of the sea, you cannot be a fish."

"If a crocodile deserts the water, he will find himself on a spear."

In speaking about endurance, one might say:

"If there is a continual going to the well, one day there will be a smashing of the pitcher."

Sometimes the sayings or proverbs from two different countries may have a similar meaning, but different modes of expression. For example, some Japanese water sayings have an English equivalent. In Japan one might say, "Fukusui bon ni kaerazu," or "Spilt water never returns to the tray." In English one would comment, "It's no use crying over spilled milk." A possible interpretation for both of these sayings is that one should not have regrets over what has already occurred. In Japan if someone were advising you to be prepared for an event, he or she might add, "Have an umbrella ready before you get wet."

Several English adages are associated with observations about rain, snow, dew, etc. For example, "Save it for a rainy day" refers to thriftiness, and "You're skating on thin ice" warns of trouble. In the 1700s, Ben Franklin wrote, "You won't miss the water till the well runs dry." This simple and direct saying could be interpreted to apply to conservation of resources.

Proverbs or sayings provide insight into a culture and indicate a people's awareness of and relationship with water. A German philosopher of the 1700s wrote: "Proverbs mirror the thinking of a nation."

Procedure

▼ Warm Up

Open the discussion of proverbs or sayings by writing a few examples on the board. Ask students to share any proverbs that they have heard within their own families. Have them be more specific by citing any sayings that are related to water. (See *Water Proverbs/Sayings*.)

Have students discuss the characteristics of proverbs. Relate how proverbs pass from generation to generation, occur in most cultures, and reflect the values and beliefs of the people. Explain how proverbs have been used to teach a lesson or moral or to indicate how individuals should conduct themselves within a culture.

Ensure that students understand the difference between literal and figurative meanings. For example, the literal translation of "raining cats and dogs" entails household pets falling from the sky. Figuratively, the saying implies a heavy rainfall. Have them identify the literal and figurative meanings of some of the proverbs listed on the board.



▼ The Activity

Part I

1. Show students the list of *Water Proverbs/Sayings* provided in this activity. Ask students to review the water sayings from different countries. Do they understand what they mean? Have students discuss why so many sayings relate to water.
2. Divide the class into groups of four. Distribute to each group one set of *Water Sayings* and one set of *Water Illustrations* cards. Each set has twelve cards. Six of the cards illustrate literal interpretations of the sayings written on the six remaining cards.
3. Have the group sit in a circle and determine who will be the "reader." The reader holds the six *Water Sayings* cards and places the six *Water Illustrations* cards faceup (pictures showing) in the center of the circle.
4. The reader will select a card and read aloud the saying that is written on it. Players must touch the picture card that they believe shows the literal translation of the saying. If a player touches the correct card, he or she keeps the saying and the picture card. (The reader consults the *Answer Key* to be sure the players are correct in their selec-

tions.) If a match is incorrect, the reader will inform the player immediately, and that player must return the cards and may not guess again until a new saying is introduced.

5. The game is played until all sayings and pictures have been matched. The player holding the greatest number of cards wins!
6. Students will play the game again, but this time will determine the figurative interpretation. Have students select a new reader. Give the reader the six *Water Scenario* cards. Place the six *Water Sayings* cards faceup in the center of the four students.
7. Have the reader state the scenario aloud. The other three students will touch the saying that they believe completes the scenario. Once again, if the choice is correct, the player collects both cards. The player holding the most cards at the end of the game wins!
8. Have students design a skit demonstrating the literal and/or figurative interpretation of a proverb selected by their group. After students perform, classmates should guess the proverb being illustrated.

Part II

1. Have students remain in their groups. Give each group a copy of *Water Sayings From Around the World*.
2. Tell students their task is to match each group of sayings to the region where they originated (polar, tropical, desert, temperate). Have students respond to the following questions within their own group to help them match the sayings with the region. Do the sayings:
 - provide any clues to temperature?
 - indicate seasons?
 - reference locations of water?



- reflect scarcity or abundance of water?
- reference land forms?
- identify forms of water?

3. Discuss the matches students have determined and their reasons for them. Share the answers with students (Region A = polar, Region B = temperate, Region C = tropical, Region D = desert).

▼ Wrap Up and Action

Have the class discuss several of the proverbs or sayings and speculate how they evolved in view of the culture's relationship with water.

Have students collect proverbs and sayings related to water with their family and friends. If possible, have them contact schools or communities from other regions or cultures to find out if they have different water-related proverbs. They may want to compile sayings in a booklet, "Water Sayings of Our Community" (county, state, or region).

Assessment

Have students:

- distinguish between the literal and figurative meanings of various water sayings (*Part I*, steps 3-8).
- analyze water sayings to explore how language expresses a culture's relationship with water (*Part II*, steps 1-3 and *Wrap Up*).

Extensions

Riddles are another form of expression that reveals insight into various cultures and their relationships with water. Riddles are very popular in African cultures. Share the following examples with your students.

NOTE: African riddles are not in the form of questions, but are declarative. "A slender staff touches earth and sky at the same time." Answer: Rainfall.

"They tell him to bathe and he

bathes; they tell him to stop and he weeps." Answer: Sponge.

Have students create their own water-related riddles and attempt to stump their classmates. This would make an excellent family project.

Resources

Corwin, Charles, ed. 1980. *A Dictionary of Japanese and English Idiomatic Equivalents*. Tokyo, Japan: Kodansha

International, Ltd.

Jablow, Alta, and Paul Goodman. 1961. *Yes and No, The Intimate Folklore of Africa*. New York, N.Y.: Horizon Press.

Williams, Terry Tempest, and Ted Major. 1984. *The Secret Language of Snow*. New York, N.Y.: Pantheon Books.

Water Proverbs/Sayings

- A drop in the bucket
- A flood of . . . (tears, mail)
- A stepping stone to . . .
- Blood is thicker than water
- Bugged down --
- Break the ice
- Crying buckets
- Don't change horses in mid-stream
- Down the drain
- Even if you sit at the bottom of the sea, you cannot be a fish (Africa)
- Feeling swamped
- Finding your sea legs
- Get your feet wet
- Get your ducks in a row
- Have an umbrella ready before you get wet (Japan)
- Having a ripple effect
- Icy stare
- If a crocodile deserts the water, he will find himself on a spear (Africa)
- If there is a continual going to the well, one day there will be a smashing of the pitcher (Africa)
- In hot water
- It's all water under the bridge
- Jump in with both feet
- Like water off a duck's back
- Little by little the cup is filled (Spain)
- Make a big splash
- Mind in a fog
- On cloud nine
- One hand washes the other
- Pull the child out of the water before you punish it (Africa)
- Raining cats and dogs
- Sink or swim
- Somebody is all wet
- Something smells fishy
- Something snowballs
- Steamed up
- Still waters run deep
- The stone in the water knows nothing of the hill which lies parched in the sun (Africa)
- The well's run dry
- Today is the elder brother of tomorrow, and a heavy dew is the elder brother of rain (Africa)
- Took hook, line, and sinker
- Treading water
- Troubled waters
- Wash my hands of the whole matter
- Watered down
- Wet behind the ears
- Wet your whistle
- When it rains it pours
- When our ship comes in
- With too many rowers the ship will crash into the mountain (Japan)
- You are not the alligator's brother, though you swim well by his side (Africa)
- You won't miss the water till the well runs dry

Water Sayings

<p>Skating on thin ice</p>	<p>Tip of the iceberg</p>
<p>We'll cross that bridge when we get there.</p>	<p>Like a duck to water</p>
<p>Madder than a wet hen</p>	<p>You can lead a horse to water, but you can't make it drink.</p>



Water Illustrations (Literal Interpretations)



Water Scenarios (Figurative Interpretations)

<p>"Mom, I played well this week, but what about the game next week? What if I miss a fly ball? What if I strike out? What if a grounder gets past me?"</p> <p>"Juan, don't worry, . . ."</p> <p>Answer: We'll cross that bridge when we get there.</p>	<p>"I can't believe Phyllis has broken up with Mark. She was crazy about him. It must be because he embarrassed her in the cafeteria yesterday."</p> <p>"No, Phyllis has been telling me about their problems for a long time. The blow-up in the cafeteria was just the . . ."</p> <p>Answer: Tip of the iceberg.</p>
<p>"So, what happened when your mom got home and saw the mess we made at your house? I bet she wasn't too happy about the cherry soda we sprayed on the curtains, or the chocolate sauce we smeared on the white carpet, or the rec room that we filled with the garden hose—I was sure we could make an indoor swimming pool."</p> <p>"She was . . . She said I was grounded until I was a grandfather—that's about another 60 years!"</p> <p>Answer: Madder than a wet hen.</p>	<p>"Did you go to Nyasha's piano recital last night?"</p> <p>"Yes, it was wonderful. Did you know she has only been taking lessons for one year?"</p> <p>"Wow! she has taken to the piano . . ."</p> <p>Answer: Like a duck to water.</p>
<p>"I can't believe Yasu. The music was awesome at the dance; the girl he wanted to ask was there; and he stood by the refreshment table all night. He didn't even ask one person to dance."</p> <p>"Well, you know what they say. . . ."</p> <p>Answer: You can lead a horse to water, but you can't make it drink.</p>	<p>"Mom, can I have four quarters for a video game?"</p> <p>"No, son, we don't have time."</p> <p>"Please, Mom, I'll hurry; I only need four quarters."</p> <p>"No, we're already late for dinner."</p> <p>"Come on, Mom, you always say that. Please, just four quarters."</p> <p>"That's enough, Garrett, you're . . ."</p> <p>Answer: Skating on thin ice.</p>



Water Sayings From Around the World

Region A

1. Ice three feet thick is not frozen in a day.
2. What lay hidden under the snow comes to light at last.
3. Much February snow, a fine summer doth show.
4. No one thinks of the snow that fell last year.

Region B

1. Up a creek without a paddle.
2. After a storm comes a calm.
3. The sea refuses no river.
4. Little drops of water make the mighty ocean.



Region C

1. Till you are across the river, beware how you insult mother alligator.
2. Store up the water while it rains.
3. Don't empty your water jar until the rain falls.
4. What is written on sand is washed out by the tide.



Region D

1. A trickle of water is better than no water.
2. Putting the water back in the well is not waste.
3. If you go first you will not drink muddy water.
4. Gently flowing water will hollow even a rock.



Answer Key (For Part I, step 4)

Water Sayings

Skating on thin ice
Tip of the iceberg
We'll cross that bridge when we get there
Like a duck to water
Madder than a wet hen
You can lead a horse to water,
but you can't make it drink

Water Illustrations Drawing of:

Boy on skates
Iceberg
Boy and girl and bridge
Duck with towel
Chicken
Horse and girl and tub of water



Raining Cats and Dogs

Irene Stephens and Rita Hinz's class

Students with physical disabilities

Lead-up Activities conducted Nov. 1

Main Activity conducted Nov. 1–3, 6–7

Location: Outside, in classroom, in school library

Dora d'Amato's and Rita Treese's classes together

Students with developmental and behavioral disabilities; students with multiple disabilities

Lead-up Activities conducted in weeks prior to activity

Main Activity conducted Nov. 13–14

Location: In classroom

Adaptations and Modifications Implemented for Each Factor

Presentation Methods

Irene and Rita H. related this activity to previous experiences. When forming groups, they made sure one member could read and one could write. They reviewed concepts frequently and gave non-verbal students ways to respond to the discussion by giving them word choices. Students with communication devices can spell out words, or can be given choices to which they can respond.

Dora and Rita T. made sure that students were grouped heterogeneously and that there was an even ratio of good readers to poor readers.

Lead-up Activities

Irene and Rita H. went outside with their students to observe fall trees, other plants, and water resources. They discussed sources of water, and the importance of water in the environment.

Dora and Rita T. had been discussing expressions in speech. Students had been writing about figures of speech in journals.

Physical Environment

Irene and Rita H. needed eight helpers to assist students in wheelchairs to go outside. The classroom was already arranged to decrease physical limitations for students using wheelchairs.

Dora and Rita T. set the classroom up for students to work in groups.

Material Adaptations

Irene and Rita H. made large charts showing definition of “proverbs” and some examples to accommodate visual learners and low vision learners. The students were told to bring in a proverb used in their family.

No changes were needed for Dora’s and Rita T.’s classes.

Procedural/Rule Adaptations

Irene and Rita H. wrote the definition of a proverb from the original activity on a chart. They gave each student a list of proverbs from the Water Proverbs/Sayings list and told students the figurative meaning. Students then had to match the oral example to the correct proverb. Irene and Rita H. did both parts and all steps except Part 1, step 8: designing a skit.

Dora and Rita T. conducted the activity as written for Part 1 steps 1 through 5. For steps 6 and 7, the teachers read the scenario cards to the students. Dora and Rita T. also made six more water scenario figurative interpretation cards for the students so they would have more examples of figurative speech. The teachers conducted both parts of the activity and all steps except Part 1, step 8: designing a skit.



Students in Irene and Rita H.'s class match water sayings and proverbs.

Break Activity into Tasks

Irene and Rita H. conducted this lesson over five days as a series of short lessons.

Day 1: The class went outside to observe fall trees, other plants, and water resources. They discussed sources of water, and the importance of water in the environment. The teachers introduced the activity and defined the term proverb. Students worked with partners or in small groups to do Part I. The class reviewed the literal and figurative interpretations (50 minutes).

Day 2: The class reviewed examples of proverbs and began Turf Tops (see Extension) (30 minutes).

Day 3: The teachers read and introduced background material to the class (20 minutes).

Day 4: The class reviewed proverbs. Using the Water Proverbs/Sayings list, the teachers would give the figurative meaning and students had to match the oral example to the correct proverb. Irene and Rita H. also would say the first part of a proverb, and the students would have to come up with the second part (done as a whole class).

Day 5: The teachers conducted Part 2. Students worked in groups. Before doing this part, the class brainstormed about each region and about things you would and would not see in each region.

Dora and Rita T. conducted Part 1 on one day, and Part 2 the next day. They spent 50 minutes each day conducting the activities. The activity was followed as written, with exceptions as noted in Procedural/Rule Adaptations.

Evaluating the Activity

Irene and Rita H. asked students to tell the differences between figurative and literal meanings of different proverbs.

Dora and Rita T. repeated the water scenario activity and had students write down what they thought were the correct expressions.

Extensions

Irene and Rita H. started two Turf Tops, a nylon bag stuffed with sawdust with grass seed planted on top—these are commercially available. They are personified by adding eyes, nose, and a mouth. The class gave them names and added features such as glasses and hair. The Turf Tops are about the size of a cantaloupe and the students must water them every day. All living things need water, and in this situation it's the students' responsibility to provide water.

Other Comments

Irene and Rita H. "Students needed to be cued often to emit appropriate responses."

"Repetition is vital to learning process."

Rita H.: "Teachers need to recognize the importance of group work and pairing or grouping the students appropriately into cooperative heterogeneous groups."

Dora: "I did not think Part 2 was as successful as I would have liked because students lacked the reasoning/critical thinking skills and language skills necessary. They tend to translate expressions on a literal level instead of an expressive level."

"It was interesting. Learning the definition about proverbs, matching all the pictures was kind of hard."

Student in Irene Stephens and Rita Hinz's class

WILDWORK

OBJECTIVE

Students will name and describe three wildlife occupations.

METHOD

Students brainstorm a list of wildlife-related careers, prepare presentations and dramatize occupations for their classmates.

BACKGROUND

State and federal government agencies employ many specialists to help preserve and manage wildlife and wildlife habitats. These employees do field work, conduct laboratory research and oversee human interactions with wildlife. Universities and colleges, private and non-profit wildlife oriented agencies, zoos and museums, private industry and others all employ people trained in the wildlife field. Some individuals (artists, photographers, etc.) photograph, paint, draw or write about wildlife for magazines, books, films and television.

The major purpose of this activity is for students to become familiar with career possibilities available in wildlife-related fields.

MATERIALS

writing materials

PROCEDURE

1. Ask the students if they've thought about what careers they might be interested in pursuing when they

grow up. What kinds of jobs sound interesting? What about working with wildlife?

2. In a class discussion, find out what kinds of jobs students imagine exist in animal-related fields. Do any of their parents have animal- or wildlife-related jobs? Make some suggestions about possible careers and compile a list of occupations that students have brainstormed.

3. From this list, have each student choose one job to portray to the class. Encourage them to bring props from home to help in their portrayal. Items such as realistic stuffed animals, toy cameras, research notebooks, outdoor dress and magazine pictures can be used.

4. Have each student, in turn, name, describe and portray his or her occupation to the class. (Or, portray first, and have the students guess the occupation!)

5. Wrap up with a discussion of the range of careers available in wildlife-related fields.

For Older Students

1. Ask the students what careers might be interesting after school. What about working with wildlife? Find out what kinds of jobs students imagine exist in animal-related fields. Do any of their family or friends have animal-related occupations, involving either wild or domesticated animals, or both?

2. Compile a list of possible wildlife-related occupations.

3. Ask each student or group of students to select one occupation to research. Find out what preparation (e.g., college) is needed for the job; what the responsibilities of the job entail; what special equipment, techniques, or skills are needed, if any; and whether there is growing, diminishing, or no change in the demand for people in this occupation.

4. Have each group report to the rest of the students. This reporting can take a variety of forms from skits about each job to a Wildlife Careers Resource Fair. The Resource Fair could have booths for each job, complete with visual aids; background information; and local contacts for additional information. Open the Fair to the whole school and invite people working at these jobs to attend and share their inputs in person.

Age: Grades K-12

Subjects: Career Education, Language Arts, Social Studies, Science

Skills: description, discussion, listing, synthesis

Duration: ten-minute introduction; 20 minutes for presentation or longer depending on size of group

Group Size: any

Setting: indoors

Conceptual Framework Reference: IV.F.10.

Key Vocabulary: occupation, vocation, career

Appendices: Local Resources

EXTENSIONS

1. Contact someone in a wildlife-oriented job and ask that person if he or she would be willing to contribute a class visit or letter describing the job and other wildlife-related jobs. Have the students prepare questions in advance for the visitor. (Government wildlife agencies usually have a descriptive leaflet about jobs. Write for a copy.) Compile a class letter to that individual, incorporating any questions that students might have. Some good questions to ask could be:

- Why did you choose this career?
- What education was necessary to prepare you for this job?
- How hard is it to get a job after you are trained?
- What do you do in a typical day's work?
- How much do you actually work with wildlife? How much with people? How much with record keeping, reporting, etc.?
- Do you work with people who have other wildlife-related careers?

Share the letter of reply with the class or have the professional visit the class to answer questions.

2. Investigate jobs related to a range of natural resources—from forestry to mining to litigation. Look at volunteer and private organizations as well as public and commercial, from attorneys for the National

Wildlife Federation to public land coordinators for major oil companies.

3. Since most wildlife in the United States is managed as a legal responsibility of state wildlife agencies—and yet the wildlife habitat may be on public as well as private land—make a “wild web,” showing the agencies, organizations and occupations that typically could be involved in a wildlife management issue.

AQUATIC EXTENSION

Focus specifically on the variety of aquatic-related careers that are available.

EVALUATION

1. Name and describe three jobs in which someone works with wildlife or other animals. Describe what kind of training and qualifications are required for each job?
2. Are there many jobs available in wildlife-related fields? Please explain your response.
3. Why, if at all, do you think careers in wildlife and other resource-related fields are important?



Wildwork

Irene Stephens and Rita Hinz's class

Students with physical disabilities

Lead-up Activities conducted Oct. 16

Main Activity (Older Students option) conducted Oct. 16–20; 23–24

Location: In classroom, in school library

Dora d'Amato's class

Students with developmental and behavioral disabilities

Lead-up Activities conducted Nov. 6

Main Activity (Older Students option) conducted Nov. 6–10

Location: In classroom, computer lab

Rita Treese's class

Students with multiple disabilities

Main Activity (Older Students option) conducted Nov. 6–10

Location: In classroom, computer lab

Adaptations and Modifications Implemented for Each Factor

Presentation Methods

Irene and Rita H. related this activity to previous experiences. They used pictures of wildlife workers to accommodate visual learners. They brainstormed and discussed wildlife conservation careers for auditory learners and listed the careers on the board for visual learners. Vocabulary was presented visually on a chart.

Dora made a questionnaire that students completed about their chosen career to help them conduct research (see Material Adaptations). Students used the Ohio Career Information System (OCIS) computer database program to research careers.

Rita T. used the OCIS database with her students to research careers.

Lead-up Activities

Irene and Rita H. brought in newspaper articles about conservation careers.

Dora introduced students to OCIS computer system so they could access information.

No specific lead-up activities were conducted by Rita T.

Physical Environment

Irene and Rita H. needed to move to a larger room to accommodate a large circle of students in wheelchairs. They used two rooms to spread out to make posters. For the extension, they used the school library to include regular education students with their students for the speaker from the Ohio Department of Natural Resources.

Dora used the computer lab for part of the activity. The classroom furniture was already arranged in a large U-shape that allowed students to have enough room to work on their reports and collages.

Rita T.'s students already had their desks arranged in a U-shape. Rita T. made sure that all the students could see the board when graphing the data.

Material Adaptations

Irene and Rita H. used pictures of wildlife workers with the class. They brought in magazines, used the World Wide Web, the school library, encyclopedias and other reference books to locate information. Each student group made an informational poster about their career.

Dora's students used the OCIS database to gather information. Students brought in magazines from



Class reports hang from the wildlife occupations collage in Dora's room.

home and used magazines from school to make a class collage about wildlife careers.

Rita T. provided pamphlets, magazines, and other handouts from the Ohio Department of Natural Resources related to wildlife and conservation careers. She also used the OCIS database with her students. Rita used paper and different colored markers for graphing career information.

Procedural/Rule Adaptations

Irene and Rita H. asked students to bring in articles from the newspaper or magazines about wildlife careers or wildlife management. These articles were shared by the groups researching different careers. The class brainstormed and discussed wildlife conservation careers. Some examples of careers that the students came up with were veterinary medicine, marine biology, animal trainers, circus animal trainers, wildlife technicians, fisheries, and zoo keepers. The students divided themselves into groups based on their interests. The groups were different sizes, and ended up being homogeneous based on career interests. The teachers noted that the homogeneous groups didn't work out well, because lower-functioning students ended up being in groups by themselves and needed a lot of guidance from the teachers. Irene and Rita H. rotated through the groups to make sure that they were actually working on the posters and using the information they researched. For Step 4, each group of students made informational posters about their career and presented the information to the rest of the class. They used the questions from Step 3 to complete the posters.

Dora made a questionnaire that students completed about their chosen career. The following questions

were asked:

Describe the job.

What aptitudes do you need if you are interested in this job?

What is the work setting for this job?

What do employers look for when hiring for this job?

How many people do this job in the United States?

How many people do this job in Ohio?

What do people get paid for doing this job?

What are some skills required to do this job?

What education do you need to do this job?

What courses in high school do you need to take if you are interested in this job?

For Step 4, each student used the questions and answers to put together a formal report about their career. They presented their report to the class individually. Some students reported independently, others needed Dora to ask questions and then they would answer with the information they researched. Careers included the following fields: park ranger, veterinarian, fish hatchery work, and farming.

Rita T. had students answer the following questions about their career:

Name of job.

What would your salary be?

What schooling would you need?

What would be your job?

What skills would you need?

What would your schedule be?

Did they work inside or outside?

For Step 4, students graphed the information for each category.

Break Activity into Tasks

Irene and Rita H. conducted this activity during seven short sessions, each about 20 to 30 minutes long.

Day 1: They presented background information, brainstormed careers with students and discussed if any of their families worked with wildlife.

Day 2: The class studied vocabulary (career, occupation, vocation) and played a game of matching a vocabulary word to its meaning. Irene and Rita H. charted the vocabulary and passed out definitions to the students. The class had to match the definition with the correct word.

Day 3 and 4: The students researched material and completed posters.

Day 4: The students finished their posters and the groups made formal presentations to the rest of the class.

Day 5: The class evaluated and reviewed their projects.

Day 6: Students prepared questions for the guest speaker.

Day 7: The guest speaker conducted his presentation (see Extension).

Dora conducted this activity during five sessions, each about 50 minutes long.

Day 1: She introduced OCIS in the computer lab.

Day 2: The class brainstormed careers. Dora asked students which job they would like to research.

Day 3 and 4: Students located information and worked on guided research questions and found pictures to make their collage. When they completed the questionnaire, they had to find five pictures in magazines that related to any type of conservation career.

Day 5: Students made presentations about their careers.

Rita T. conducted this activity during five sessions, each about 50 minutes long.

Day 1: She shared conservation information with students.

Day 2: She and the students decided which jobs to research.

Day 3: Rita T. helped students find information in brochures, pamphlets, and magazines.

Day 4: She helped students access the computer and compile information.

Day 5: The class reviewed information and graphed data about their careers.

Evaluating the Activity

In addition to using the evaluation questions listed in the activity, the teachers did the following:

Irene and Rita H. evaluated the posters. Students evaluated themselves and the other group members.

Dora graded the final research paper and gave a participation grade for oral presentations.

Rita T. evaluated students' participation in the activity, and whether they were able to complete the assignment or not.

Extensions

Irene and Rita H. had a speaker from the Ohio Department of Natural Resource Division of Wildlife come speak to the class. The students prepared questions in advance and asked him the following:

Why did you choose your career?

How do you go about getting a job like this?

Do you like it?

How hard was it to get a job after you were trained?

What kinds of animals do you deal with?

Do you like working outside?

Do you like to work around baby animals?

What do you like most?

What do you like least?

Have you ever delivered a baby animal? If so, how did you feel? Were you happy or excited?

Do you feed the baby animals? What do you feed them?

Do you help cats?

Do you help hurt animals?

What is your average yearly income?

Do you work with people who have other wildlife-related careers?

Do you get days off?

Do you use computers a lot?

Because of speech problems, the students handed the questions to the speaker and he read them out loud and answered them. One of the students took notes on his responses, so the class had a record of the information.

Dora's students completed a large collage to put on the wall about conservation careers. They also used the OCIS career interest inventory to determine other jobs of interest.

Other Comments

Irene and Rita H.: "When we divided into groups we asked 'who would like to research this career?' Many more able students chose to work together. It would have been more effective if we had divided students into heterogeneous groups."

"Our group studied being a marine biologist. . . . I didn't know it meant dealing with pollution and water and all that. I never knew that. I learned something I didn't know."

Student in Irene Stephens and Rita Hinz's class

After the classes completed field-testing the activities, Karen Ricker interviewed the teachers and their assistants to get their impressions about conducting the activities, inclusion ideas, and how these activities related to their curriculum goals.

Other Considerations: A Conversation with the High School Teachers*

Irene Stephens and Rita Hinz (teach students with physical disabilities)
Dora d'Amato (teaches students with developmental and behavioral disabilities)
Rita Treese (teaches students with multiple disabilities)

What surprises did you encounter in terms of what the students learned and how they responded to the activities?

Rita H.: The big surprise to me was when we had the higher functioning group of kids working on their poster, and they had a harder time staying on task.

Irene: I think it was because they are a social group. I was pleased that our kids were amused by the proverbs, and were quick to participate.

Rita T.: I was surprised by how much they enjoyed the activities.

What advice would you give to other teachers who want to conduct environmental education activities with students who have disabilities?

Rita H.: Pair-up the students, do cooperative learning. Really go over the terms ahead of time with the whole group—you really need to set the stage for it. Make sure that when you pair-up, the able-bodied student doesn't just take over the whole activity; that student should be someone who can work with the other person, and pull them into the activity. Assign roles if necessary. You have to do some assessment on your own, and find out who works well with others—you have to be there and help guide the groups. Pair readers with non-readers for reading activities.

Rita T.: Plan way ahead so you have all the stuff you need, resources and materials.

Dora: You have to make sure you give yourself an ample amount of time to do the activity, and be flexible with your timeline.

In what ways would you use these activities with inclusive groups?

Rita H.: The activities lend themselves real well to cooperative learning techniques. Work on team building skills first; don't just throw the kids together and expect them to work together.

Irene: The kids in this school are used to working together, and with students who have disabilities. The real key is getting the teachers involved, and getting the teachers to understand that these kids are able to participate and learn. The teacher needs to set the tone for all the students.

Dora: Scheduling-wise, I have no idea how I would do that [team-up with a regular education class].

Rita T.: Me neither.

Dora: At our high school it's difficult. Logistically, I don't know how it would work.

In what ways were these activities able to meet the educational requirements of your students in terms of their Individualized Education Program (IEP) or your curriculum?

Rita H.: We explore careers, and the activities enhance science and social studies. They tie in with problem solving, vocabulary enrichment, thinking skills with the brainstorming, and life skills—working with other people.

Irene: The idea of interdependencies really relates to our students. Some of them really depend on people to help them use the restroom, eat, and dress—our kids are really interdependent.

Rita T.: The Wildwork activity related to careers, which is part of our curriculum.

Do you plan to continue using these activities or other environmental education activities this year and next? If no, why not?

Irene: Yes. They encourage interactive skills in a natural environment.

Rita H.: I love them. I can use them in social studies and science.

Irene: I will use these activities frequently to enhance the curriculum.

Rita T.: Yes, I think I will continue to use some of them.

Dora: I would like to think that I would, but from day-to-day it's difficult to say what I'll be doing. I do think they are good activities, and I would like to use them in the future.

Is there anything else you want to say about your experience with conducting the activities?

Irene: It's important for teachers to pay attention to the vocabulary. I was hoping that we would go outdoors more, but the lessons we chose didn't really lend themselves to being outdoors as much as others.

Rita H.: We usually divided into groups for activities, and we put those with language abilities together with those who have language difficulties. There needed to be a verbal student and a student who could write in each group. Most of the students are quite good at communicating with each other—it's not unique for them. They all have different needs. A lot of kids with the communication devices can spell out words, or you can give them choices of responses. You can also make topic boards, and give choices with words or pictures to help communicate.

Irene: Teachers need to stress the importance of all students having a chance for input, even those with communication devices or who have visual problems. We're lucky because that's what we teach our kids. We don't think about that so much as an adaptation, but it is something that a teacher needs to be aware of, that's one of the reasons the activity went so well for us because the kids are already in the mode of working cooperatively in groups.

Dora: I'll be honest. The problem I had with these activities and others in the activity books, is that I would look at them and wonder how they relate to our kids. There are so many functional things at our level that our students need. These were really great activities and the kids got into doing them. But the information they got out of it doesn't really relate to what I need to teach them. It was a question of how functional were these activities.

Rita T.: Now the "Wildwork" activity I thought was more functional because it was about jobs, and that's something in high school we're very interested in.

What types of activities would be functional? What would you want to have focused on?

Rita T.: I need to focus on whether my students learn good work skills, counting money, hygiene—really basic functional things.

Dora: Functional for us would be recycling, measuring and cooking. Most of my science focuses on health related topics. I don't have anything against these activities; I think they're really great.

What about connecting some of these activities to English or Social Studies?

Dora: Yes, that's possible. "Raining Cats and Dogs" related to our speech curriculum. You could use these activities with creative writing exercises. But again, my students' writing is focused on job applications, it's very functional.

At this point, do you still feel that you would continue using environmental education activities with your students?

Dora: Yes, as long as I could pick and choose from different activities and I would make sure that it related to our functional objectives.

Rita T.: As long as the activities relate to what the students need.

**Based on separate interviews with the teachers. Irene and Rita Hinz were interviewed together, and Dora and Rita Treese were also interviewed together. This "conversation" has been edited for clarity. Student names have been changed to maintain confidentiality.*

Section 4: Into the Community

- **Why Get Involved in Community Service Projects?**

- **Project Descriptions:**

A gardening project with middle school students who have developmental disabilities

Middle school students with multiple disabilities share environmental activities with senior citizens

A gardening project with elementary school students who have multiple disabilities

"Although my students are disabled, they don't always need to be the ones who are served, they can also serve someone else."

Kathy Gordon,
teaches students with multiple disabilities

Why Get Involved in Community Service Projects?

As the teachers and their students showed us in Section 3, it is possible to include students with disabilities in environmental education activities. You can also actively involve students with special needs in community service projects. “Community” can include the school-yard, neighborhood near the school, a project that involves one of the local parks, or any type of community collaboration. We encourage you to go beyond the classroom by extending environmental-related activities into the community, whether that’s the school community, the local neighborhood, or beyond.

Getting involved in projects that serve others can enable students to:

- Improve social skills.
- Increase feelings of self-worth.
- Improve ability to work in groups, or with others.
- Offer an opportunity for inter-generational learning (especially in projects with senior citizens).
- Increase basic skills such as reading and writing.
- Practice problem solving skills.
- Engage learning by actively involving students in a project.
- Relate to career exploration and job skills development.

Community service projects can include having students develop an inventory for all accessible environmental and educational resources within your school’s community; developing a recycling program for your school and local community; delivering lunches to senior citizens; donating time in a local animal shelter; building bird feeders from recycled materials; developing an educational wetland in a “swampy” area that has been abandoned; or working with a local park to build accessible trails. These are just some suggestions to get you started on incorporating a service project with your students. For more information contact the National Youth Leadership Council, 1910 West County Road B, Suite 216, Roseville, MN 55113; 612-631-3672.

The following community service projects were conducted by three of our teachers who were involved in Project Ohio Outdoor Access.

Project Descriptions*

Danielle Whitcomb’s Class

A gardening project with middle school students who have developmental disabilities (see Class Descriptions in Section 3).

Conducted in the Fall (3 days) and Spring (3 days).
Materials needed: trash bags, hand trowels, garden rake (part 1); flowers, hand trowels, mulch (part 2). The school provided the trash bags, students brought in garden tools from home, mulch was donated, plants were donated and some were purchased by the class.

Danielle and her students conducted a service project for their school. The project consisted of two distinct parts: Fall clean-up and Spring planting.

Part 1: Fall Clean-up

During the fall clean-up, Danielle’s class cleaned up the flower beds in front of the school. The flower bed runs the length of the school building. The students started at one end and worked their way down. The beds contained old marigolds and impatiens. They conducted the clean-up in mid-October.

Danielle assigned jobs for each student and students worked individually or in pairs, depending on their ability level. A sighted person was paired with Ross to help direct him, and someone was with Chip to help him stay on task. The jobs consisted of the following: holding the trash bag, pulling up old plants, picking up trash, and pulling up weeds. All the students had a turn performing each job to get practice and experience. The fall clean up was organized as follows:

Day 1 (1 hour): Students pulled up the old big plants first. The marigolds were so overgrown, they were the size of bushes. Children that weren’t pulling out plants, picked up trash along the beds, and in the front yard.

Day 2 (1 hour): Students pulled out the smaller plants and weeds.

Day 3 (1 hour): Students raked the beds to prepare for winter. They raked the existing mulch evenly over the beds and cleaned up the beds. Some of the students used their hands, some used tools, and some the rake, to evenly distribute the mulch and make it look more presentable. They also filled in holes.

Part 2: Spring Planting

For the Spring planting, the school found a company to donate mulch. The mulch was deposited in a large pile. During a school clean-up day held before



Danielle's students plant flowers in front of the school.

the students planted the flowers, parent volunteers had spread some of the mulch over the beds. Previous to the planting days, Danielle purchased marigolds, begonias, and impatiens. Some of the plants were donated by people in the community and some were purchased with money that the students raised by working in the school store. Six flats of flowers were planted. The Spring planting was conducted in mid-May.

As in the Fall, Danielle assigned jobs for each student and students worked individually or in pairs, depending on their ability level. A sighted person was paired with Ross to help direct him, and someone was with Chip to help him stay on task. The jobs consisted of the following: a hole digger, someone who followed the hole digger and put the flower in the hole, and the person who followed the flower person and patted the soil around the flower to make sure it was planted correctly. Students also pulled weeds and picked up trash. All the students had a turn performing each job to get practice and experience. There were extra flowers so students planted flowers around four trees on the school grounds as well as in the flower beds. Three students were very good about working on their own and they worked independently planting flowers around the trees. The spring planting was organized as follows:

Day 1 (1 hour): The students spread the mulch around the beds to evenly distribute. The class decided where to plant the marigolds, begonias, and impatiens in the main flower bed. The students also helped finish preparing a new flower bed in front of a new school sign. The sign company dug a bed in a

semi-circle in front of the sign. The students edged the border; Danielle drew a line for the border and the students had to pull weeds and grass around the edge.

Day 2 (1 hour): Students planted the flowers.

Day 3 (2 hours): Students finished planting the flowers and spreading mulch around the new plants.

Why was this activity important for your students to do?

"I think it made them feel more connected to the school as well as the community. It was something that they learned to do at school, and we learned to do something for someone else. Not only did we benefit by looking at the flowers, but the people who live across the street had a nicer

view of the school. Angela went home and her mom let her plant flowers around their home. Diana's mom had her planting flowers at their house. It was also a skill they were using at home not just at school. They had the ability to learn something at school and apply it elsewhere."

What did they learn from this experience?

"Cooperation—they had to work together, and they had to supervise each other and make sure that things were done properly. A couple of kids also made sure that the plants were standing upright and not laying down, some of them checked to make sure the plants were in soil, and not just in the mulch. They also learned about the nutrients that the plants needed. They learned basic lessons about how the plants would grow and what they needed. The students enjoy this and take pride in telling the other students in the school that they are responsible for beautiful flowers and upkeep in the front of the school."

Michele Raker-Morris' Class

Middle school students with multiple disabilities share environmental activities with homebound senior citizen (see Class Descriptions in Section 3). Conducted during the entire school year; activities were conducted an average of once a month. Materials needed: video camera, regular camera, film, paper, pens, pencils (for correspondence), wood, varnish, hammer, nails (for the bird feeder), transportation to the nursing home.

Michele and her students conducted a year-long community outreach project with Martha (not her real name), a 93-year-old woman who lives in a nursing home. Martha has cerebral palsy, is immobile and non-verbal. She spends most of her time in bed. Martha had not had a visitor from anyone except county officials for 10 years before Michele's class started corresponding with her.

The previous year, one of Michele's former substitute teachers, Penny, met Martha. Penny now works as a caseworker for the county and Martha is one of her clients. Penny thought that Michele's class would be interested in corresponding with Martha as a way to help her know what's going on in the world. So Penny came to school one day and asked if the students wanted to be a friend to Martha, and that's how the project began.

Penny videotaped the students as they field-tested the environmental education activities. She also took pictures of the students. After the initial videos, students wrote letters to Martha. Penny got a bulletin board for Martha and tacked up the students' pictures and letters, so Martha can keep-up with what the class is doing. Michele's class wrote letters and Penny would read them to Martha. Since Martha cannot talk and is unable to write, Penny would write a reply letter about Martha's reactions to the student's letters.

The students' pictures were on Martha's bulletin board, so when Penny would read a letter from a student she would point to the picture to let Martha know which one was writing the letter. That's how Martha got to know the students, what they liked to do, and their hobbies. The class also visited Martha at her nursing home four times during the year: February, April, May, and in early June before school ended.

The nursing home was about a 20-minute drive from school and transportation was provided by Michele, Penny, and Toni. Michele says that "we always knew she was excited to see us because she would throw back her head and open her mouth like she was laughing, and when we gave her the bird feeder, she was just thrilled."

When the class visited Martha, the students went into her room two or three at a time to see her, because it would be overwhelming for her to have the whole class in at the same time. All of the students were involved with visiting Martha.

Michele's students also made a bird feeder for Martha. Penny said the one thing Martha loved was looking out her window and because she's in bed all the time, her bed faces the window. Michele's students and Penny thought that a bird feeder would keep birds coming back and forth and that Martha would enjoy seeing that. Michele talked to the school's occupational therapist (OT) about making a bird feeder as a class project. The OT took a couple of students to the school library and they found books on bird houses. They brought the books back to the classroom and all the students went through them, and the OT helped them pick out a design that they could make: a design that would be easy to make and that would involve all the students. The OT brought in the wood pieces, saw, hammer, varnish and the students built the bird feeder. The bird feeder looks like a house with paneled sides. Each student had an opportunity to cut board, hammered the pieces together, and varnish the wood.

Throughout the year, students worked independently or in small groups when writing letters to Martha or when making the bird feeder. Students were assisted when needed by Michele and her teaching assistant in completing these tasks. Michele also kept a picture of Martha in the room to help students focus on to whom they were writing letters.

Why did you think this activity was important for your students to do?

"I don't know how many of them are involved with their own grandparents and I think it helps them see that there are others in situations where they need someone to be a friend. My kids are great kids that make people feel good, so when Penny approached me about having my class correspond with Martha, I said we would love to do this. I didn't know how my kids would react. When we went to the nursing home,



Two of Michele's students give the bird feeder to Martha.



Michele's students construct the bird feeder.

the other residents would come out to visit too. So when we were in the dining room, everyone would be there and we interacted with the other residents. They would sit there and talk to the kids and the kids would talk with them, and it was fun.”

What did your students learn from this experience?

“I think they learned that it’s neat to do things for other people. They always ask about Martha, they got a feeling that they were part of someone else’s life. They were responsible for some of the things that happened to this person that made her feel good. And I think for them [the experience] was also about them being able to be a friend and remember her. They reached out to someone in the community and brought Martha into their lives.”

Kathy Gordon's Class

A gardening project with elementary school students who have multiple disabilities.[†]

Conducted in early May for one day at Recreation Unlimited.

Materials needed: hand trowels, shovels, plants, mulch, transportation to Recreation Unlimited. Materials supplied by Recreation Unlimited, a local landscaping company, and Kathy Gordon’s class.

Kathy and her students conducted a service-learning project. Kathy acquired \$200 in funds from a grant through Learn and Serve America, and designed the project herself. Since she and her students go camping at Recreation Unlimited she thought of doing a service for them as an organization. Kathy says that “although my students are disabled, they don’t always

need to be the ones who are served, they can also serve someone else.”

The gardening project focused on planting flowers, bushes, and trees at Recreation Unlimited (RU). A local landscaping company provided some of the trees, shrubs, and bushes, and Kathy’s grant provided some of these materials and transportation for her class and another group of students with multiple disabilities from a middle school. Students planted flowers (annuals), shrubs, and small trees. Students also spread mulch on the flower beds, and planted flowers in different areas: in raised brick planters, and also in a raised beds near the flag pole.

The landscaping company contributed towards some of the labor. They gave the students instructions on how deep the holes should be for the trees. The project was organized as follows:

Classes arrived at RU at 10 am. There were 10 students and seven adults (teachers, teaching assistants, and parents) involved in the project. The project was divided into the following jobs: dig holes for flowers; plant flowers; dig holes for trees; plant trees; dig holes for shrubs; plant shrubs; spread mulch. Students were divided into pairs or small groups; there was a lot of supervision, and the adults worked right along with the students. Each group had a different assignment and the students took turns rotating jobs so that each person had an opportunity to experience every aspect of planting a garden. Some of the students had difficulty with mobility and needed some assistance, but once they were shown how to hold the tools, or spread the mulch they were able to do the job. After they were given some assistance they were pretty motivated to try it.

During the day, the students worked in the morning, took a break for lunch, and finished planting in the afternoon. They left RU by 2 pm to go back to school.

Why was this activity important for your students to do?

“For one thing it was an opportunity for them to get out into the community. It was an opportunity for them to learn some new skills, and I think that’s good for their self-esteem. It was good for them to do a service for someone else. Also the fact that they were given a job and they completed it was good for their self-esteem, and good for their vocational skill development.”

What did your students learn from this experience?

They learned how to work together, they learned how to complete a job and stay on task, and get something done. The students were able to see the planted flower beds when they went camping at RU several weeks later. They ended up doing more gardening around the school, they weeded flower beds around the school, they planted flowers for volunteer appreciation week. We also made planters for Mother's Day, so this was a skill that we could do in other areas."

**Students' names have been changed to maintain confidentiality.*

**Kathy conducted this project the previous year. She had five students in her class, and two of these students, Tommy and Steven, were also in her class during the 1995-96 year (see Class Description in Section 3). The students who conducted the gardening project were moderately to severely impaired cognitively, and some had mild physical disabilities.*

Section 5: Conclusion

Unlimited Classrooms: A Resource Guide for Inclusive Environmental Education is based on a pilot project that involved nine groups of students with disabilities and their teachers. The classes field-tested a set of environmental education activities that they selected. It is our hope that you will be able to use their suggestions for modifying activities with your own students. Whether you are a special education teacher, therapeutic recreation specialist, teacher of an inclusive class, a park naturalist, an outdoor education center staff member, or a volunteer educator, we hope that you have a better understanding about the following concepts from this resource guide:

- Children of all abilities can actively participate in environmental education activities.
- It is possible to adapt activities that you already use in your curriculum. You do not have to reinvent the wheel to include students with disabilities in environmental education programs.
- There are specific factors to consider before adapting activities (see Section 2). Analyzing how to adapt an activity by examining these factors will help facilitate the modification process.
- When adapting activities, remember that you are making modifications in order to make the activity accessible to students, not modifying the objectives of the activity. Adapt only when necessary.
- Students are able to learn new information by being involved in these activities. This new information can include understanding new concepts about the natural world, or gaining new social and problem solving skills from cooperative group-work.

- Students with disabilities can make contributions to their community through service projects.
- People with disabilities are the experts when it comes to their disability. Don't be afraid to ask students to explain what their limitations and abilities may be.
- Inclusion enhances learning for all students, those with and without disabilities.
- Inclusive settings increase socialization so that students with disabilities are not stigmatized in the classroom.
- Students learn appropriate social behavior by interacting with each other in inclusive settings.
- Students without disabilities learn that students with disabilities are capable and productive people.
- As shown by several of the teacher's comments, experiential learning enhances many students' comprehension skills, whether they have a disability or not.
- Even though a person appears "low functioning," a hands-on approach can benefit him or her. A student will perform up to the expectations of the teacher. Therefore, be careful not to place limits on students which may prevent them from reaching their full potential.

In addition to these concepts, we also hope that you have a better understanding of how to relate to people with disabilities—always remember to put the *person first!*

"I think we both teach each other something new."

A regular education student in Natalie Hetrick's class offers her view on inclusion

Appendix A: Glossary

Americans with Disabilities Act

See **Legislation**.

Asthma

Asthma is a chronic condition characterized by wheezing or labored breathing. This is caused by constriction in the individual's air passages and by excessive secretion in the tubes of the lungs. The decrease in the size of the air passage makes breathing, particularly exhalation, difficult. The causes of the condition are not fully understood, but allergic reactions to food or food particles in the air appear to precipitate it. Excessive emotional stress is not considered a primary cause but can make an attack worse. The severity and duration of asthma attacks vary considerably.

The treatment of asthma involves removing ingestants and inhalants from the person's environment. He or she may also be given injections to increase the resistance to allergic reaction. Breathing exercises and mechanical drainage of the lungs may also be helpful. During an acute attack, medication can be used to relax the bronchial tree.

AIDS

Acquired Immune Deficiency Syndrome (AIDS) is caused by the human immunodeficiency virus (HIV). AIDS produces a progressive impairment in the body's immune system, eventually rendering the body's immune system helpless against infection.

Most adults are infected through unprotected sexual practices which involve the exchange of bodily fluids. Sharing contaminated needles while engaging in intravenous drug use is also a common mode of infection. Before there was a screening for HIV, blood banks could not test for the presence of the virus in donated blood. Some recipients of blood transfusions before 1986 are at risk for HIV exposure. Infants can acquire HIV from their infected mothers.

HIV cannot be transmitted through saliva, sweat, or tears. Mosquitoes and public restrooms are not possible sources of HIV exposure.

Asperger Syndrome

A form of abnormal personality characterized by social aloofness and lack of interest in other people. It is considered a mild form of Autism.

Autism

Autism is a behaviorally defined syndrome occurring before three years of age. The severity of the condition varies. Etiology is unknown. The following are characteristics of autism:

- Not responsive to usual teaching methods
- Inappropriate laughing or giggling
- No understanding of real dangers
- Self-injurious behavior
- Difficulty in expressing needs; may use gestures
- Inappropriate attachment to objects
- Echoes words and phrases
- Inappropriate response, or no response to sound
- Resistant to being hugged
- Sustained unusual or repetitive play
- Uneven physical or verbal skills
- Avoids eye contact
- Standoffish manner
- Extreme distress (for example, crying tantrums) for non-discernible reason
- Spins objects or self
- Does not mix well with others
- Resists changes to routine
- Physically overactive or passive

Behavior Disabilities

Many children with behavior disorders do not want to be touched, do not exhibit affection, and may not show awareness of others. The Ohio Department of Education defines the term "Severe Behavioral Disabilities" as a condition exhibiting one or more of the following characteristics over a long period of time and to a marked degree; these characteristics adversely affect a student's educational performance: (1) an inability to learn, which cannot be explained by intellectual, sensory, or health problems; (2) an inability to build or maintain satisfactory interpersonal relationships with peers and teachers; (3) inappropriate types of behavior or feelings under normal circumstances; (4) a general pervasive mood of unhappiness or depression; and (5) a tendency to develop physical symptoms or fears associated with personal or school problems.

Severe Behavioral Disabilities does not include children who are socially maladjusted unless it is determined that they are behaviorally disabled. This definition is adapted from *Rules for the Education of*

The information in this glossary is from the Recreation Unlimited Staff Training Manual unless noted otherwise.

Handicapped Children, 1982, Ohio Department of Education, Division of Special Education.

Cerebral Palsy

Cerebral Palsy is an inclusive term used to describe a group of conditions brought about as a result of damage or malformation of the brain (or parts of the brain). Generally this refers to brain damage occurring before or at birth, or before the age of two. Damage occurs at this time, but is not progressive. What this means is that the person is left with deficits in motor control, coordination, balance, speech, hearing, or perception. We all learn to roll over, sit up, stand up, and balance before we walk. The person with cerebral palsy may be slowed down in this progression of development. The amount and degree of the disability will vary from a slight walking problem to needing the use of a wheelchair and being completely dependent on others for physical care. This depends on the extent of damage and which parts of the brain have been affected. This does not mean that intelligence has been affected, although it may be.

There are five types of cerebral palsy, but most are of a mixed nature:

1. **Spastic:** This is the largest group. This condition is characterized by certain muscles that tend to show a stretch reflex. This means that when muscles are moved, they contract and prevent the intended movement. This action causes stiffness within the muscle and hyper-irritability to all stimuli. Movements are stiff, jerky, and uncertain. Sensory impulses reach the brain, but there is an inability to inhibit certain impulses while performing others. This results in a loss of reciprocal action. Spasticity of speech mechanism may cause a speech problem. Emotional stress, strain, and external stimuli cause the individual to stiffen whenever voluntary motion is attempted and relaxation is difficult.
2. **Athetoid:** This is the second largest group. This condition is characterized by muscles that are normal but which make involuntary, non-purposeful movements. The individual usually lacks the ability to direct the lips, tongue, extremities, or trunk in the desired motion.
3. **Ataxia:** Characterized by the inability of the individual to control balance. It is also characterized by disturbance in equilibrium, coordination, and muscle tone regulation. Sensation may be affected so that differences of heat, cold, and touch cannot be discerned. Individuals may have defects of vision and in the speech mechanism. There is a lack of postural sense and balance.

4. **Rigidity:** Characterized by muscles which are stiff but not tense. The stretch reflex present in the spastic muscle is absent. In testing the individual with rigidity, it would be possible to push him or her over without having the muscles contract in a protective effort.
5. **Tremor:** This condition is not common in children, but is frequently seen in older people. There are different types of tremors that are a form of cerebral palsy.

Developmental Disability

Approximately two of every one hundred Americans have a developmental disability. The federal government and Ohio define a developmental disability as a severe, chronic disability of a person that:

- Is attributable to a mental or physical impairment or combination of mental and physical impairments
- Is manifested before a person reaches age 22
- Is likely to continue indefinitely
- Results in substantial functional limitations in three or more of the following areas of major life activity: self-care; receptive and expressive language; learning; mobility; self-direction; capacity for independent living; and economic self-sufficiency
- Reflects the person's need for a combination and sequence of special interdisciplinary or generic care, treatment, or other services that are of lifelong or extended duration and are individually planned and coordinated. Ohio bases eligibility for services on a person's degree of limitation in various areas of life activity.

Diabetes

Diabetes is a disease of metabolism. It is characterized by the inability of the body to use starches and sugars properly when taken in normal food supply. Insulin breaks down sugar so it can be used and stored. A person with diabetes has a decreased supply of sugar or lack of insulin resulting in the accumulation of excessive amounts of sugar in the bloodstream which is excreted through urine. The individual who is diabetic must be checked regularly to determine sugar levels. Increased levels of activity and changes in daily routine require close supervision and adjustments of insulin intake. The childhood diabetic is difficult to control as the child may not realize the significance of diet control and regular exercise.

Epilepsy

Epilepsy is derived from a Greek word meaning "seizure." A person having a seizure is characterized by convulsions in the muscles, partial or total loss of

consciousness, mental confusion, or disturbances of bodily functions which are usually controlled automatically by the brain and nervous system. Some individuals may experience an “aura” or warning signs such as fear, sounds, smells, or other impressions. There are different degrees from mild (brief staring) to major psychomotor reactions.

Hearing Impairments

Individuals who are hard of hearing are those who have enough hearing with or without the use of hearing aids to acquire speech. Individuals who are deaf are those who have such a severe hearing loss that they cannot learn speech in the usual manner.

There are many challenges individuals who are deaf or hard of hearing will face. This person has an invisible disability which often elicits annoyance and irritation on the part of hearing persons. Trying to communicate to a person who is deaf, for some, is such a frustrating experience that many times the individual will give up trying to communicate and avoid contact with a person who is deaf. Individuals who are deaf often have unintelligible speech which may cause others to ridicule them. The individual, in turn, becomes frustrated because she or he is unable to communicate verbally and may turn to inappropriate, aggressive behavior or may withdraw all together.

Types of deafness:

1. **Congenital:** born deaf
2. **Adventitious:** development of deafness
3. **Conductive:** physical obstruction to the inner ear (impacted wax, head cold blockage)
4. **Sensori-neural:** inner ear or auditory nerve defect
5. **Psychogenic:** emotional reasons prevent response to sound
6. **Central:** abnormality of the central nervous system prevents hearing, caused by brain damage

Hemophilia

Predominately hemophilia is an inherited male disorder in which the clotting mechanism in the blood is impaired. The knee is the most frequently affected site followed by the ankle and elbow. Once any joints become weakened, it becomes more susceptible for repeated hemorrhaging, leading to joint arthritis. Minor cuts, scratches, bruises, excessive exercise, and direct strain to the joints cause bleeding which may require transfusions. Internal bleeding is extremely critical. This may be evidenced by black and blue spots, swollen joints, and limited movement. If an individual begins to hemorrhage, the limb should be immobilized, ice packs should be applied and medical personnel should be contacted immediately.

Hepatitis

A virus that causes the liver to swell. There are three different forms of hepatitis which are:

1. **Hepatitis A:** transmitted by food or drink contaminated by a carrier, commonly in situations where sanitation is poor.
2. **Hepatitis B:** transmitted by infected blood or blood products, hypodermic needles, blood transfusion, or tattooing needles.
3. **Hepatitis C:** caused by a virus transmitted during transfusion of blood or blood products and by contaminated needles used by drug users.

Hydrocephalus

See **Spina Bifida**.

Individuals with Disabilities Education Act See Legislation.

Legislation

The Rehabilitation Act of 1973 was one of the earliest pieces of legislation that guaranteed that people with disabilities must have the same access to facilities and services as people without disabilities. The Individuals with Disabilities Education Act (IDEA) of 1990 is an update to the Education for All Handicapped Children Act of 1975. IDEA has been instrumental in mandating free and appropriate education for all children with disabilities from infancy through age 21. It brought students with and without disabilities together within the same school. IDEA was the catalyst toward fully including individuals with disabilities into society. The Americans with Disabilities Act (ADA) of 1990 covers people with disabilities of all ages, especially adults who are out of high school. The ADA focuses on making employment, public accommodations, transportation, telecommunications (information accessible in formats that people can use), and government services accessible for people with disabilities.

Lifting Students

When lifting any student, the person should be kept close to the teacher's body and the lifting should be done from the knees and not from the back. Unnecessary lifting should be avoided. Any student who has to be lifted, and weighs over fifty pounds, should be lifted by two adults rather than just one. Serious personal injury could result if two people are not used. Lifting may be made easier by propping the student on the knee, rather than lifting him or her directly from the ground or chair. It is best to inquire from the student as to how the family manages to transfer him or

her from one spot to another. Lifting should be avoided whenever possible and teachers should look for ways in which the student can help himself or herself.

One Person Pivot: done with individuals who can bear weight on their legs.

1. Keep your back straight.
2. Talk to the person you are lifting; let him or her know what you are doing.
3. Move the wheelchair into position, lock brakes, unfasten the seatbelt, and check for any obstacles.
4. Slide the person to edge of the chair.
5. Place your feet against the student's feet; your knees against the student's knees.
6. Grasp arms around the student's back—securely.
7. Put your head to the side of the student's head.
8. Ask the student if he or she is ready and secure.
9. Lower your position—this will rock the student forward.
10. Hug the student—this will pull him or her toward you.
11. Pivot.
12. Sit the student down—slowly lower your position; your knees should still be in position, your feet against the student's feet, and your head close to the student's head.

Two Person Lift: transfer done with individuals who cannot bear weight on their legs.

1. Place wheelchair in a strategic position (close to where you are transferring to or from.)
2. Lock the brakes—check seat belt, remove necessary parts such as armrests.
3. Plan out the lift between the adults and student.
4. One person should be facing the student—squat, keep back straight, arms locked under student's knees or further up to distribute the load.
5. Back person—up close and tight to the student, your arms under the student's armpits. Cross your arms, grab opposite wrists, and hold your arms close to student's stomach.
6. Hug the student close to prevent him or her from flopping forward.
7. Make sure your back is straight.
8. Lift—communicate—count together (one, two, three, lift).
9. Lower student gradually.
10. Be confident before lifting—ask for help if needed.

Multiple Sclerosis

Multiple Sclerosis (MS) is a chronic, usually progressive disease of the central nervous system. Most

people with MS usually first exhibit symptoms between the ages of 20 and 40. MS causes dysfunction in the central nervous system; paralysis ranging from partial to complete can result. Tremors and sensory loss are not uncommon. Persons with MS may also experience vision problems such as double vision and temporary blindness; speech difficulties such as slurring words; and partial or total loss of bladder and bowel control. MS has no set pattern of development. The disease is very individual—parts of the body affected can differ from person to person, and may affect an individual differently from one stage to another. The causes and nature of the progression of MS are unknown. This information is adapted from literature from The Multiple Sclerosis Society, Mid-Ohio Chapter.

Muscular Dystrophy

Muscular Dystrophy is a genetic hereditary disease which results in a progressive wasting away of muscle which is replaced by fibrous tissue and fat. This is usually transmitted from mother to son and the degree and rate of progression is extremely varied. It is referred to as a pseudohypertonic, meaning false overgrowth. The person may appear to have big calves, buttocks, and shoulders; this is actually fat and fibrous tissue rather than muscle. Some individuals with types of MD do not have large calves, but rather they are quite skinny. However, the same progression of events is occurring.

There are various types of Muscular Dystrophy. Duchenne's is the most common and affects more males than females. It usually appears by age three, and is characterized by weakness in the pelvis, abdomen, and hips with a waddling gait and forward curvature of the spine.

Orthopedic Disabilities

Orthopedic disabilities are characterized by problems of bones or joints:

1. **Amputations:** Amputations may occur congenitally from a birth defect or as a result of an accident or disease necessitating the removal of a limb. Usually this person will wear a prosthesis.
2. **Arthritis:** Arthritis is an inflammation of the joints making them painful to move. Care should be taken not to overwork the person.
3. **Arthrogryposis:** Arthrogryposis is a congenital condition in which the person is unable to fully extend his or her joints due to contractures or adhesions. If a person is more affected, the individual will be unable to move his or her joints, and will require complete care.

4. **Osteogenesis Imperfecta:** Osteogenesis Imperfecta is an inherited condition in which the bones are abnormally soft and brittle. A heavy touch, slight fall, or attempt to walk can cause a fracture.
5. **Legg-Perthes:** Legg-Perthes is a condition in which the blood supply to the head of the femur is diminished. The bone becomes softer and the head of the thigh bone becomes flat. The healing process takes one to three years during which time the person must be non-weight bearing; any weight bearing movement will cause pain. A person may appear to walk with rigid knees and may either have crutches and/or an abduction bar and braces.

Phenylketonuria (PKU)

PKU is a recessive gene disorder that affects the metabolism of proteins. PKU can be identified in infants by a simple blood test that should be administered shortly after birth. The probability that the disorder will result in retardation can be reduced through a diet low in phenylalanine.

Pica

Pica is an abnormal craving to eat objects and materials not ordinarily considered to be foods. The causes of pica are not completely understood. The most common poisons eaten as a result of pica are those that are used in the manufacturing process. They include: inorganic metals and non-metals used in paints; matches; volatile organic poisons used in paints, soaps, and cleaners; pesticides; cigarette butts; and feces.

Prader-Wili Syndrome

Prader-Wili Syndrome is a mental deficiency marked by a shortness of stature, obesity, and sexual infantilism, muscular hypotonia, and swallowing difficulty.

Rehabilitation Act

See Legislation.

Schizophrenia

A severe mental disorder characterized by a disintegration of the process of thinking, of contact with reality and emotional responsiveness.

Spina Bifida

This is a congenital malformation of the spinal cord and the supporting vertebral column causing the spinal cord to herniate through the spinal cord column causing paralysis below this point. Most of the time this occurs in the lower back and the person will have a surgical scar.

Many people with spina bifida have slightly enlarged heads due to the trauma to the spinal cord, thus upsetting the balance of spinal fluid and causing an increase of pressure on the head. This is known as hydrocephalus and also occurs apart from spina bifida. The spinal cord and brain are bathed in spinal fluid which is produced and reabsorbed into the bloodstream in the brain. This fluid circulates up and down, bathing the brain and spinal cord. Due to congenital or developmental defects in the system (for example, a blockage of channels, an increase of pressure), an increase in skull size occurs. This can cause neurological damage. The degree of damage will again vary a great deal.

The nerves to the bowel and bladder are almost always impaired and the person may have a type of urinary receptacle, use suppositories, or be on a regular time schedule for bowel movements. Individuals with loss of bowel control may be habit trained by having toilet routine set up on a definite time basis. Consideration should be given to diet to avoid a laxative or constipating effect. A person with this disability will usually have a bowel routine already set up at home and will know his or her individual time schedule.

It is more difficult to regulate loss of bladder control. Again, the person will have a bladder routine set up in all probability and this should be followed according to the individual's time schedule. Males may wear rubber urinals which they may care for themselves, but should be checked frequently for wear, pressure, and cleanliness. Females may wear diapers, sanitary pads, and rubber-lined panties and should be changed frequently to prevent chafing and skin ulcers.

Individuals with spina bifida are prone to contracture (tightness of the muscles and tendons which prevent movement at the joints), particularly of the hip if maintained in one position such as sitting in a wheelchair for long periods of time. Frequent changes in body position and maintaining good body alignment is important.

With the loss of sensation, individuals with spina bifida cannot differentiate between temperature and care should be stressed in bathing and other activities to prevent burns from the use of too hot water or other sources of heat. Also with the loss of pain sensation, they may not feel the friction of braces, chafing, beginning of pressure areas on skin, or trophic (skin) ulcers.

Visual Impairments and Blindness

Impaired vision ranges from a very slight visual defect to total blindness in both eyes. Its causes are numerous. Blindness is the more familiar term for loss

or absence of vision. Economic blindness refers to the state of vision which renders a person unable to do any work for which sight is essential.

Partially sighted persons are those with serious defects who, with the aid of special devices, are able to read and perform tasks requiring vision.

Causes of visual impairments or blindness include the following:

1. **Macular degeneration:** causes a blind spot in the center of vision.
2. **Cataracts:** clouds the lens of the eye. The degree of impaired vision is determined by location of cataract, blurring of vision and unpleasant glare in bright light.
3. **Retinitis Pigmentosa:** visual transmission of picture to the brain does not take place. Vision is of little practical use. Night blindness and loss of peripheral vision occur.
4. **Glaucoma:** pressure caused by eye fluids which results in damage to optic peripheral vision.
5. **Diabetic Retinopathy:** results from diabetes with degree of impairment influenced by blood pressure and hemorrhaging in retina.
6. **Retinal Detachment:** retina separates from lining causing a loss of vision.

Visual Deviations:

1. **Myopia:** nearsighted; objects in distance are blurred
2. **Hyperopia:** far sighted; near objects are blurred.
3. **Strabismus:** cross-eyed or squint
4. **Heterophoria:** muscular imbalance of eye
 - a. Esophoria—inward
 - b. Exophoria—outward
 - c. Hypophoria—upward and downward

Appendix B: Annotated Bibliography

This bibliography is divided into nine sections:

- Environmental Education: General Activity Guides and Curricula
- Environmental Education: Community and Action Projects
- Environmental Education for Students with Disabilities
- Outdoor Education/Camping/Adventure Programs for People with Disabilities
- Science for Students with Disabilities
- Inclusion: Environmental/Outdoor Education
- Inclusion: General Resources
- Disability Resources
- Resource List for Recreation, Integration and Advocacy

The list of materials shown here is not exhaustive; it offers a starting point for finding environmental education-related resources and information on inclusion and disabilities. Most of the materials listed here were located by conducting a search of the Educational Resources Information Center (ERIC) database. Information about grade levels are included when provided by the publishers.

Environmental Education: General Activity Guides and Curricula

Aquatic Project WILD: Aquatic Education Activity Guide (second edition)

Houston, TX: Council for Environmental Education, 1992

Grades K-12

Aquatic Project WILD emphasizes aquatic wildlife and ecosystems. Activities in this activity guide are organized into seven major sections: (1) awareness and appreciation; (2) diversity of wildlife values; (3) ecological principles; (4) management and conservation; (5) people, culture and wildlife; (6) trends, issues, and consequences; and (7) responsible human actions. Activities in *Aquatic* are designed for easy integration into school subjects and skill areas (see Project WILD entry in this section).

Earthkeepers

S. Van Matre and B. Johnson

Warrenville, IL: Institute for Earth Education, 1988
Grades 4-6

This is an environmental program geared for children ages 10-12 that focuses on understanding how energy and matter connect all areas of life; increasing positive feelings about nature; increasing understanding of the Earth; and fostering appreciation and stewardship of our natural world.

Environmental Education in the Schools

J. Braus and D. Wood

Troy, OH: North American Association for Environmental Education, 1994

This book includes teaching strategies, fund-raising, evaluation tips, resources, and activities focusing on everything from problem-solving to field-trips. Originally written for Peace Corps volunteers.

Environmental Education Teachers Resource Handbook: A Practical Guide for K-12 Environmental Education

R. Wilke (editor)

Millwood, NY: Kraus International Publications, 1993
K-12

This handbook is designed to serve as a guide for information on the background of environmental education curriculum, plus offer information on current materials, standards, and special materials. Chapters include information on the "environment" in the K-12 curriculum; integration and curriculum design; funding curriculum projects; assessment; state-level guidelines; materials; children's trade books in environmental education; and other topics.

Essential Learnings in Environmental Education

D. Hanselman, K. Sarabhai, and M. Raghunathan (editors)

Troy, OH: North American Association for Environmental Education, 1990

The editors have compiled 600 facts and concepts considered vital in the field of environmental education. The building blocks for environmental education programs are sorted by topic and classified by several coding systems including learning level and type of information: definition, fact, issue, opinion.

Fostering a Sense of Wonder During the Early Childhood Years

R. Wilson

Bowling Green, OH: Ruth Wilson, 1993
Pre-school

This curriculum focuses on integrating environmental education and early childhood education. Part I introduces the curriculum; Part 2 contains activities for implementing the curriculum; Part 3 includes special considerations; and Part 4 focuses on program evaluation.

Hands-on Nature: Information and Activities for Exploring the Environment with Children.

J. Lingelbach (editor)

Woodstock, VT: Vermont Institute of Natural Science, 1986

Grades K-6

This collection of activities is organized as nature "workshops" that are grouped into four chapters: adaptations; habitats; cycles; and designs of nature. Workshops are arranged in seasonal order in each chapter. Each workshop contains background information, resources, and activities.

Integrating Environmental Education and Science: Using and Developing Learning Episodes

D. Cantrell and P. Barron (editors)

Newark, OH: Environmental Education Council of Ohio, 1994

K-12

This document is designed to assist curriculum developers and leaders of learners in designing or redesigning their curriculum. The editors use the term "learning episodes" for the activities included in this book. Each learning episode focuses on an environmental or science concept for students in grades K-12.

Keepers of the Animals: Native American Stories and Wildlife Activities for Children

M. Caduto and J. Bruchac

Golden, CO: Fulcrum Publishing, 1991
Grades K-6

Keepers of the Earth: Native American Stories and Environmental Activities for Children

M. Caduto and J. Bruchac

Golden, CO: Fulcrum, Inc., 1989
Grades K-6

Both of these books contain a collection of Native North-American stories and related hands-on activities designed to inspire children and promote responsible stewardship toward animals and the Earth. An interdisciplinary approach to teaching about animals, the environment, and Native North-American culture is emphasized. Student activities involve reading, writing, social studies, science, mathematics, and theater.

Keepers of the Animals: Teacher's Guide

M. Caduto and J. Bruchac

Golden, CO: Fulcrum Publishing, 1992

This teacher's guide provides supplementary text and reading lists related to the chapters in *Keepers*. Discussed here are concepts about ecological education, environmental ethics, Native North-American stories, and the Native world of creation.

Living Lightly in the City: An Urban Environmental Education Curriculum Guide

M. O'Connor and K. McGlaufflin

Milwaukee, WI: Schlitz Audubon Center, 1988
Grades K-6

This curriculum is divided into two volumes grouped by grade levels. Volume I is for grades K-3 and volume II is for grades 4-6. The activities focus on environmental education in an urban environment. In volume I; activities focus on the senses; environmental appreciation; cycles and interrelationships between plants and animals; discriminating between wants and needs; energy use; and other topics. In volume II activities focus on appreciation of neighborhood and natural areas in the city; land use; water resources; fossil fuels; water cycles; rock cycles; food webs; air and water quality; and other topics. Both volumes are divided into 12 units that cross-list activities by subject area.

Living Lightly on the Planet: A Global Environmental Education Curriculum Guide

M. O'Connor

Milwaukee, WI: Schlitz Audubon Center, 1988

Grades 7-12

This curriculum is a continuation of the K-6 volumes above. This curriculum is divided into two volumes grouped by grade levels. Volume I is for grades 7-9 and volume II is for grades 10-12. The activities focus on environmental education in an urban environment. Activities in volume I focus on population growth; land use; water resources; connections and cycles; ecosystems; recycling; and other topics. Volume II includes activities on carrying capacity; water resources; toxins; social responsibility; nuclear power; technology; and other topics. Both volumes are divided into six units that cross-list activities by subject area

Project Learning Tree: Environmental Education Pre K-8 Activity Guide (third edition)

Washington, DC: American Forest Foundation, 1995
Grades Pre K-8

Through hands-on, interdisciplinary activities, Project Learning Tree provides students with opportunities to investigate environmental issues and encourages them to make informed, responsible decisions. PLT uses the forest as a "window on the world" to increase students' understanding of our complex environment; to stimulate critical and creative thinking; to develop the ability to make informed decisions on environmental issues; and to instill the confidence and commitment to take responsible action on behalf of the environment. Activities in the guide are organized by five major themes: diversity; interrelationships; systems; structure and scale; and patterns of change. PLT activities can be easily integrated into science, language arts, social studies, art, music, and physical education.

Project WET Curriculum and Activity Guide

Bozeman, MT: The Watercourse and the Council for Environmental Education, 1996

Grades K-12

Project WET is a water education program for educators and students in grades K-12. The goal of Project WET is to facilitate and promote awareness, appreciation, knowledge, and stewardship of water resources through the development and dissemination of classroom-ready teaching aids and through the establishment of state and internationally sponsored Project WET programs. Project WET activities are

meant to be easily integrated into science, language arts, social studies, art, music, and physical education. Activities are organized into seven major concepts: water has unique physical and chemical characteristics; water is essential for all life to exist; water connects all Earth systems; water is a natural resource; water resources are managed; water resources exist within social constructs; and water resources exist within cultural constructs.

Project WILD K-12 Activity Guide (second edition)

Houston, TX: Council for Environmental Education, 1992

Grades K-12

Project WILD is an interdisciplinary, supplemental conservation and environmental education program emphasizing wildlife. The goal of Project WILD is to assist learners of any age in developing awareness, knowledge, skills and commitment to result in informed decisions, responsible behavior and constructive actions concerning wildlife and the environment upon which all life depends. Activities in Project WILD are designed for easy integration into school subjects and skill areas. The activities are organized into seven major sections: (1) awareness and appreciation; (2) diversity of wildlife values; (3) ecological principles; (4) management and conservation; (5) people, culture and wildlife; (6) trends, issues, and consequences; and (7) responsible human actions.

Ranger Rick's NatureScope

Washington, DC: National Wildlife Federation
1996

Grades K-6

The NatureScope series is a collection of single-topic activity guides (most about 60 pages long) that contain activities and background information on topics for teachers and students. The following topics are covered by the series: endangered species; birds; insects; mammals; wetlands; geology; trees; oceans; rain forests; dinosaurs; deserts; reptiles and amphibians; pollution; astronomy; and wildlife crafts.

Science Through Children's Literature: An Integrated Approach

C. Butzow and J. Butzow

Englewood, CO: Teacher Ideas Press, 1989

This book offers teachers another approach for teaching elementary-level science by using children's literature. The authors provide criteria for selecting books. The book is divided into four sections. Part 1 presents an integrated approach to scientific instruc-

tion using children's literature as its foundation. Part 2 focuses on Life Science; Part 3 on Earth and Space Science; and Part 4 on Physical Science. The authors highlight 33 books and provide specific activities for each.

Sharing Nature with Children

J. Cornell

Nevada City, CA: Dawn Publications, 1979

Cornell presents 42 activity/games which introduce the world of nature to children and adults. Each activity includes a reference chart which describes the basic idea of each game; the concepts, attitudes and qualities it teaches; when and where to conduct the activity; the number of participants needed; appropriate age levels; and special materials needed.

Sharing the Joy of Nature

J. Cornell

Nevada City, CA: Dawn Publications, 1989

This book is a sequel to *Sharing Nature with Children*; activities can be used with children and adults. Cornell describes a process for flow learning: a method of leading nature activities that encourages people to awaken their enthusiasm, focus their attention, relate to a direct experience, and share their ideas.

Environmental Education: Community and Action Projects

Cycles for Science: Community Volunteer Projects

Pittsburgh, PA: Steel Recycling Institute, 1995
Grades 9-12

This guide for community service projects provides suggestions for community volunteer opportunities that involve students in partnerships with service agencies, governments, recycling programs and environmental organizations. Included are case studies, worksheets for project planning, and information on additional resources.

Project Learning Tree Secondary Environmental Education Program

Washington, DC: American Forest Foundation, 1995

A series of learning modules that deal with current topics and issues. Students follow a learning sequence that includes awareness, knowledge, and challenge levels that lead to personal or group action projects. Module topics include environmental issues, forest ecology, municipal solid waste, air quality, environmental concerns in the school, and biodiversity.

Promoting Environmental Education—An Action Handbook for Strengthening EE in Your State and Community

A. Ruskey and R. Wilke

Troy, OH: North American Association for Environmental Education, 1994

This handbook focuses on how to develop and build support for comprehensive state and local environmental education. It contains an organizer's tool-box, case studies, resources, sample budgets, bylaws, and model environmental education legislation.

Taking Action: An Educator's Guide to Involving Students in Environmental Action Projects

Houston, TX: Council for Environmental Education, 1995

This Project WILD publication, developed in cooperation with the World Wildlife Fund, contains case studies about students conducting action projects at the school and community level. The book also includes an overview of action projects, rationale for conducting action projects, and how to implement these projects into your curriculum.

WILD School Sites: A Guide to Preparing for Habitat Improvement Projects on School Grounds

Houston, TX: Council for Environmental Education, 1993

This Project WILD publication aims to help students and teachers take responsible action to improve their communities for people and wildlife beginning on their school grounds. The book centers on the rationale for WILD school sites and principles of wildlife habitat. Ideas and suggestions for WILD school site projects are also highlighted.

Environmental Education for Students with Disabilities

An Environmental Approach to Pupils with Special Needs

M. Newbury

Environmental Education (Journal of the National Association of Environmental Education, U.K.), Vol. 45, pp. 30-31, Spring 1994

The article describes the interdisciplinary approach of one British school for students with disabilities to make students aware of environmental issues and to foster active participation in the care of the school and the extended environment. Discusses activities

designed for the elementary, middle, and senior schools integrating environmental education into science, mathematics, language arts, and geography classes.

Celebrate the Earth: An Environmental Education Curriculum for People with Varying Abilities

Loretto, MN: Vinland Center, 1993

This environmental education curriculum focuses on using environmental education activities for people with and without disabilities. The book is divided into four units by age level: Introduction to Nature (grades K-3); Habitats (grades 4-7); Forest Ecology (grades 8-12); and Wetlands (adult). Information about integration techniques, guidelines for adapting activities and working with inclusive groups; how to modify existing materials; and information about disabilities and appropriate terminology are included.

Environmental Education and the Disabled

R. Filmer

Environmental Education Bulletin, No. 3, pp. 26-32, Nov. 1990

Describes specific plans for making environmental education accessible to people with disabilities by adapting trail systems and facilities for safety, interpretative programming, and access. Encourages the inclusion of people with disabilities in the wide variety of environmental education programming by presenting solutions to traditional barriers.

Environmental Education Needs of Special Populations.

M. Bialeschki

Journal of Environmental Education, Vol. 13, No. 1, pp. 39-44, Fall 1981

Presented are the results of a review of environmental education and interpretation literature related to special populations. Also included are the findings of a study which assessed the present environmental education and interpretive activities, offerings, needs, and problems encountered by special population agencies and consumers in Minnesota.

Integrating Outdoor/Environmental Education into the Special Education Curriculum

R. Wilson

Intervention in School and Clinic, Vol. 29, No. 3, pp. 156-159, 187, Jan. 1994

This article argues for integrating outdoor or environmental education into the special education cur-

riculum. It discusses the definition and philosophy of outdoor/environmental education and notes similarities between outdoor education and special education. A list of suggested resources is included.

Teaching Environmental Awareness Using a Terrarium.

K. Doult and D. Airhart

Teaching Exceptional Children, Vol. 23, No. 4, pp. 38-41, Summer 1991

Techniques for using a terrarium to teach principles of environmental science and environmental awareness to students that are mildly retarded, learning-disabled, or gifted are suggested. Environmental cycles (water, respiration, photosynthesis), appropriate plants, and terrarium construction and care are covered.

Outdoor Education/Camping/Adventure Programs for People with Disabilities

A Special Place Helping Special People

M. James

Conservationist, Vol. 36, No. 4, p. 33, January-February 1982

This is a report of a conference held at the Pocono Environmental Education Center, in Dingman's Ferry, Pennsylvania. The conference was designed to provide science and environmental educators with an opportunity to work with people with physical disabilities in outdoor activities.

Bradford Papers Annual, The, Vol. III, 1988

G. Robb (editor)

Bloomington, IN: Indiana University, Bloomington, Dept. of Recreation and Park Administration, 1988

Indiana University's Bradford Woods Outdoor Education, Recreation and Camping Center publish an annual collection that promotes scholarly writing, applied research findings, and innovative programs and activities in experiential education. Topics of the 1988 papers that are related to people with disabilities includes the following: "Adventure Education for People Who Have Disabilities" by D. Sugarman. This article is a review of the literature on adventure education programs for people with physical, cognitive, or psychological disabilities.

Bradford Papers Annual, The, Vol. II, 1987

G. Robb (editor)

Bloomington, IN: Indiana University, Bloomington, Dept. of Recreation and Park Administration, 1988

Indiana University's Bradford Woods Outdoor Education, Recreation and Camping Center publish an annual collection that promotes scholarly writing, applied research findings, and innovative programs and activities in experiential education. Topics of the 1987 papers that are related to people with disabilities includes the following: "Toward Fullest Participation—Suggested Leadership Techniques for Integrated Adventure Programming" by G. Lais. This article is about adventure program leadership techniques for integrating participants with various handicaps or diverse skill levels; "Foster Families and Adventure/Challenge Therapy" by T. Smith. This article focuses on adventure programs as therapeutic experiences for foster families and group home residents.

Camping: Serving the Total Child

J. Chisholm

Academic Therapy, Vol. 21, No. 2, pp. 205-210, Nov. 1985

This article discusses how a camping experience provides students with learning disabilities opportunities to increase their self-esteem, sense of social cooperation, use of language, and rapport with teachers.

DEC: Outdoor Education for the Handicapped

N. Payne

Conservationist, Vol. 36, No. 4, pp. 33, January-February 1982

The author describes three environmental education centers in New York state operated by the Department of Environmental Conservation (DEC): Rogers Environmental Education Center, Stony Kill Environmental Education Center, and Five Rivers Environmental Education Center. Professionals who work with people with disabilities are encouraged to use the facilities for outdoor activities.

Forging Partnerships: The Real Challenge

G. Robb, and S. Shepley

Camping Magazine, Vol. 61, No. 2, pp. 18-22, November-December 1988

This article is part of a special theme issue: "Focus on Special Camping Populations." The authors discuss benefits and impacts of outdoor leadership development programs upon disabled individuals, their friends, and program staff members. The article ex-

plains four outdoor therapeutic recreation program models developed at Indiana University's Bradford Woods Outdoor Education, Recreation and Camping Center.

Outdoor Education for the Handicapped: A Facilitator Guide

D. Vinton and A. Cassidy

Lexington, KY: University of Kentucky, 1983

This guide is a product of the Outdoor Education for the Handicapped Project. The concept and purpose of this facilitator guide is to provide the three facilitator groups of educators, park and resource management personnel, and parents of children with disabilities information on how to cooperatively design and implement an outdoor education program for students with disabilities. The guide is divided into eight chapters that include information on historical perspectives on outdoor education for people with disabilities; steps in the cooperative planning approach such as conducting a needs assessment, exploring possible outdoor education program models, and designing and developing curriculum; funding and financial considerations; issues of legal liability; personnel preparation and training; accessibility; guidelines and techniques for considering user needs; and other topics.

Outdoor Education for the Handicapped Project: An Overview

A. Cassidy

Las Cruces, NM: ERIC Clearinghouse on Rural Education and Small Schools, 1982

Designed for the practitioner who wants a general overview of the major program development considerations necessary for accommodating people with disabilities in the out-of-doors, this paper discusses the major highlights and results of research activities conducted by the Outdoor Education for the Handicapped Project at the University of Kentucky. The first section presents a general overview of the basic concepts and philosophies of outdoor education, federal legislation pertaining to people with disabilities (at the time of this report), and a rationale for outdoor education for people with disabilities. The major portion of the paper presents a detailed description of the process used to develop and evaluate an instructional program model, and products designed specifically for educators, park and resource management personnel, and parents of exceptional children.

Proceedings of the 1984 Conference on Outdoor Recreation: A Landmark Conference in the Outdoor Recreation Field

J. Miles, and R. Watters (editors)

Bozeman, MT: Conference on Outdoor Recreation Steering Committee, 1984

This document consists of materials presented at a conference organized by representatives of university outdoor programs to discuss issues and exchange ideas about outdoor topics. Twenty-six papers were presented; the following focused on programs for people with disabilities: "Conference on Outdoor Recreation for the Disabled: Breaking the Stereotype;" "Aquatics: A Viable Program for High Level Quadriplegics;" "Whitewater Rafting for the Disabled;" and "Scuba Diving: Mainstreaming the Disabled."

Project Explore: An Introduction to Alternative Learning Environments for Behavior Disordered Children

G. Robb and J. Leslie

Bloomington, IN: Indiana University and Bradford Woods Outdoor Education Center, 1987

Project Explore has produced four booklets that focus on outdoor activities for students with behavior disorders. The booklets include an Introduction (includes terminology, rationale for alternative learning environments, information on the Explore program); Sequential Outdoor Challenge Activities (information on how to facilitate the outdoor challenge program, and descriptions of various activities at each sequential level); Outdoor Resources and Funding Approaches (includes a sample listing of centers around the nation providing outdoor recreation programs for emotionally disabled and behaviorally disordered participants); and Evaluation Strategies and Techniques (includes information on assessments for teachers and for students).

Research in the Classroom: Fourth Annual Report of Research Projects Conducted by Educators in Their Classrooms

Denver, CO: Colorado Council for Learning Disabilities, Colorado State Dept. of Education, Division of Special Education Services, 1991

Summaries of classroom research projects undertaken by Colorado teachers of students with learning disabilities are provided in this report. For each project, the document supplies the project title, researcher, school, problem statement, objective, population, assessment, procedures, evaluation, implications, and

resources used. One project related specifically to outdoor education: "Incorporation of Outdoor Education as a Teaching Technique in the Learning Disabled Classroom" conducted by teacher Vicki Wattier.

Special Education in the Natural Environment: A Training Manual in Providing Outdoor Education, Recreation and Camping for Children with Disabilities

G. Robb, M. Havens, and J. Witman

Bloomington, IN: Indiana University, 1981

This training manual for use with personnel concerned with outdoor education for people with disabilities provides a guide to program development in the areas of background knowledge, skills and methods of outdoor education, individualized planning, and program evaluation. The manual is divided into five units: Defining; Introducing; Individualizing; Implementing; and Evaluating. Some of the questions considered by the manual include: what is outdoor education; how can outdoor programs benefit students; how can the needs of individuals in classes/programs be met using outdoor experiences; and how can the effectiveness of the outdoor education program be measured?

Special Education ... Naturally

G. Robb, M. Havens, and J. Witman

Bloomington, IN: Indiana University, 1983

This resource book provides guidelines for planning, developing, and implementing outdoor education programs for disabled youth. Part 1 offers a step by step approach to developing a program that focuses on the use of the natural environment as the primary learning element. Advice is given on individualizing the program, consistent with educational, rehabilitation or treatment objectives of participants, and developing strategies for integrating an outdoor education program into existing curricula. Included are ways of assessing the program's effectiveness and impact. Part 2 presents a variety of activities and resources in outdoor programs. Use and adaptation of equipment is discussed, and sources are suggested for additional support, ideas, and networking in regard to outdoor programming. The final section focuses on training. Included in this section is information on prioritizing training needs, processing training components, and developing training strategies for including outdoor programming in educational and rehabilitation settings.

Talking Turkey at the Wildwood Education Center

M. Warren

Pathways to Outdoor Communication, Vol. 4, No. 2, pp. 20-21, Fall 1994

A vocational education program at the Wildwood Education Center in Hornell, New York, enabled 9th and 10th grade special education students to design, build, and market turkey calls. A module on wildlife management piqued students' interest in wildlife calls and turkey hunting and led to the project. The program improved vocational skills and increased students' self-esteem.

Science for Students with Disabilities

Disabled High School Students in Marine Science

E. Keller

Nature Study, Vol. 35, No. 1 & 2, pp. 18-21, April 1982

The author describes a four-week summer marine education program for high school students with disabilities. The program was funded by the National Science Foundation for five years. Information about program goals, participants, instructors, facilities, instructional program, special equipment, and problems are discussed.

Elementary School Science for Students with Disabilities

G. Holahan, J. McFarland, and B. Piccillo

Remedial and Special Education, Vol. 14, No. 2, pp. 67-71, March 1994

This article is part of a special issue on science for students with disabilities (see *Science for Students with Disabilities* entry in this section). This article reviews science curriculum issues surrounding the education of children with disabilities. The authors examine three curricula designed especially for children with disabilities: Biological Science Curriculum Study, Full Option Science System, and Science For All Children.

Field Application of Ecological Principles for Physically Handicapped High School Students. Final Report.

B. Peterson and M. Sullivan

Carbondale, IL: Southern Illinois University, 1982

A residential instructional program was developed which provided two 2-week institutes for students with disabilities during the summer of 1982. Recognizing

that most of these students are mainstreamed and do not take science laboratory courses, the program focused heavily on the outdoor laboratory setting at an environmental center. In addition, mindful of the attitudinal, informational, and communicative barriers experienced by these youngsters, a curriculum was chosen which minimized these barriers as much as could be practicable. The program was designed to give students optimal exposure to concrete examples of theory while minimizing the amount of time spent in lecture and textbook study. This document discusses: (1) program philosophy/objectives, participant selection, and instructional staff/counselor training; (2) the curriculum and specialized adaptations; (3) the recreational program; (4) evaluation (including pre-/post-test and student/staff evaluation); (5) assessment of outcomes; and (6) dissemination efforts.

Introducing SAVI/SELPH

Berkeley, CA: University of California at Berkeley; Lawrence Hall of Science, 1981

The SAVI/SELPH Program is the combined output of two projects funded by the United States Office of Education: Science Activities for the Visually Impaired (SAVI) and Science Enrichment for Learners with Physical Handicaps (SELPH). SAVI/SELPH is an interdisciplinary multi-sensory science enrichment program that has been used effectively with blind and visually impaired students, orthopedically handicapped students, learning disabled students, developmentally disabled students, students with behavior disorders, hearing-impaired students, and non-disabled students. The SAVI/SELPH program is composed of three major components: (1) printed activity instructions and other information materials for the teacher; (2) student equipment kits; and (3) an educational philosophy for incorporating science into the curriculum of students with disabilities. The SAVI/SELPH program includes nine modules. Each module encompasses a separate content area, and contains four or more activity descriptions. The modules include: measurement; structures of life; scientific reasoning; communication; magnetism and electricity; mixtures and solutions; environments; kitchen interactions; and environmental energy.

Proceedings of the Special Needs Conference (Dingmans Ferry, Pennsylvania, August 7-11, 1981)

W. Tetlow (editor)

Dingmans Ferry, PA: Pocono Environmental Education Center, 1981

Prompted by the United Nations' International Year

of Disabled Persons, personnel from environmental field centers and related facilities attended the North-eastern Conference on Outdoor Science Education for Physically Handicapped Adolescents. The two major purposes of the conference were: (1) to provide information and skills to environmental and science educators which will be of value in working with adolescents with physical disabilities in outdoor science programs, and (2) to improve the quality of science education disseminated at outdoor centers and environmental education facilities so that it is accessible to youths with physical disabilities. Included in these proceedings are a keynote address on society's low expectations, the introductory activity which involved action socialization experiences, one panel discussion on the students with disabilities in science and another on mainstreaming, information on concurrent sessions, conference overview, evaluation, and lists of exhibitors and participants. Some of the session topics include funding, transportation, facility design, health needs, gardening, canoeing, staff training, and different curriculum materials and activities focusing on science and environmental areas.

Science for Students with Disabilities

J. Cawley

Remedial and Special Education, Vol. 14, No. 2, pp. 67-71, March 1994

This special issue includes articles that present a framework for science for students with disabilities. This article reviews curriculum and instructional perspectives. It also proposes consideration of a thematic scheme for the organization and development of science programs to meet the needs of students with disabilities.

Science Success for Students with Disabilities

R. Weisgerber

College Teaching, Vol. 42, No. 2, pp. 55-56, Spring 1994

Research suggests that although students with disabilities have the determination to succeed in science, the attitudes and inflexibility of science faculty may be a barrier. Teachers can improve this by assessing their attitudes, planning with the student, locating support services, adapting teaching methods, promoting participation, using a multi-sensory approach, and exploiting technology.

Inclusion: Environmental/Outdoor Education

Integrating Children with Severe Disabilities for Intensified Outdoor Education: Focus on Feasibility

J. Rynders, S. Schleien, and T. Mustonen

Mental Retardation, Vol. 28, No. 1, pp. 7-14, February 1990

Three students with severe cognitive, sensory, and physical disabilities attended a 2-week residential program at an outdoor education center along with eight students without disabilities. The feasibility of this program and the impact of integrated programming on camp staff members' attitudes was evaluated. By the end of the two weeks, children with severe disabilities demonstrated substantially improved skills in targeted activities. Students without disabilities substantially increased their social interactions and friendship with the campers with disabilities.

Integration and Environmental/Outdoor Education: The Impact of Integrating Students with Severe Developmental Disabilities on the Academic Performance of Peers without Disabilities

S. Schleien, D. Hornfield, and L. McAvoy

Therapeutic Recreation Journal, Vol. 28, No. 1, pp. 25-34, 1994

A study that assessed the amount of environmental information acquired by non-disabled children while participating in a one-day integrated outdoor education experience with severely developmentally delayed children is discussed. Pre-, post-, and re-testing indicated all non-disabled students in integrated classes showed statistically significant gains in learning environmental education concepts. Therefore, they were not affected negatively by learning with peers who had disabilities.

Integrated Outdoor Education/Adventure: Feature Issue

S. Schleien (editor)

IMPACT, Vol. 4, No. 4, Winter 1991-92

The 12 brief articles in this theme issue describe successful approaches to development of outdoor education programs which successfully integrate individuals with and without disabilities. Articles include: Outdoor Education and Adventure: Challenges and Rewards for All; Benefits of Integrated Outdoor Education and Adventure; Participant Comments from

Integrated Outdoor Adventures; Integrated Camping: After Two Solid Weeks of It; Camp Integration: Overcoming Barriers; Screening Participants for Outdoor Programs; How to Integrate Successfully: Promoting Positive Interactions; If I Can Do This ... The Ski for Light Experience; A Place for Healing: Vinland National Center; Making Friends with Peers and the Earth; Accessing Our National Parks; and Administrative Issues in Integrated Outdoor Programs.

Inclusion: General Resources

Educating Peter

Video: 30 minutes

Cicero, NY: Program Development Associates (1-800-543-2119)

This video won an academy award in 1992 for best short-subject documentary. It tells the story of Peter, a boy with Down Syndrome, who is included in a class with children without disabilities. The program chronicles the school year of Peter and his other third grade classmates.

Phi Delta Kappan, Vol. 77, No. 4, pp. 281-306, December 1995

This issue of *Phi Delta Kappan* includes a special section on inclusion. The following articles are included: The Real Challenge of Inclusion (D. Ferguson); Inclusion: Alive and Well in the Green Mountain State (J. Thousand and R. Villa); The Difficult Dichotomy: One School District's Response (M. Shulman and J. Doughty); Supporting Inclusion: Beyond the Rhetoric (V. Roach); Inclusive Elementary Programs: Must They Cure Students with Learning Disabilities to be Effective? (J. McLeskey and N. Waldron). The authors discuss different concerns and issues about inclusion.

Pocket Reference—A Tool for Fostering Inclusion, The

M. Block and K. Etz

Journal of Physical Education, Recreation, and Dance, Vol. 66, No. 3, pp. 47-51, March 1995

The authors discuss inclusion in physical education classes. They focus on a "pocket reference guide" they have used that provides a list of activities and instructional modifications that take place in general physical education classes. The pocket reference includes a summary of a student's IEP objectives and the instructional modifications needed for warm-up and regular activities.

Regular Lives

Video: 30 minutes

Cicero, NY: Program Development Associates (1-800-543-2119)

This video depicts children and adults with disabilities in activities (play and work) with nondisabled people. Narrated by actor Martin Sheen, the program provides a model for parents, teachers, employers, and communities interested in obstacles, strategies, and goals of inclusion.

Sean's Story: A Lesson in Life

Video: 52 minutes

Cicero, NY: Program Development Associates (1-800-543-2119)

This is the story of an eight-year-old boy with Down Syndrome who was part of a battle over inclusion. Issues include teachers that felt inadequately trained; teachers and parents asking whether inclusion was in the best interests of all students—those with and those without disabilities; and the future of the special education school. The video chronicles Sean's first year in a regular classroom and also follows the story of his friend Bobby, who also has Down Syndrome, but remained in a special education school.

Disability Resources

Access for All: An Illustrated Handbook of Barrier-free Design for Ohio, Third Edition

Columbus, OH: Ohio Governor's Council on People with Disabilities and Schooley Caldwell Associates, Inc., 1994

Developed by the AXIS Center for Public Awareness of People with Disabilities, this handbook provides guidance to those interested in eliminating attitudinal and architectural barriers for people with disabilities. The handbook incorporates recommendations from the American with Disabilities Act and the Federal Fair Housing Amendments Act. Included is information on accessible housing, public facilities, renovation and rehabilitation, discussion on costs versus benefits. Photographs and diagrams are also included. For more information call 614-262-8124 (V/TTY) or 800-231-2947 (V/TTY).

Getting There

Video: 18 minutes

Cicero, NY: Program Development Associates (1-800-543-2119)

An instructional video and picture set that teaches transportation skills in a step-by-step process. The

video stresses independence and the safe use of public transportation.

Guidelines for Reporting and Writing About People with Disabilities, Fifth Edition.

Lawrence, KS: Research and Training Center on Independent Living, 1996

This information, printed in a brochure format, includes guidelines to follow when writing about people with disabilities. Also included are preferred terms and descriptions for 24 types of disabilities or disabling conditions. For more information call 913-864-4095.

I Belong Out There

Video: 20 minutes; printed materials

Cicero, NY: Program Development Associates (1-800-543-2119)

This video features Clyde, a man with developmental disabilities leading a fairly isolated life until he discovers the person he can be: a person living life to its fullest out in the community. The program is an irreverent, entertaining look at recreation and friendships, and is filled with real-life examples. It helps motivate persons to seek out friendship through community activities.

It's All Part of the Job

Video: 21 minutes

Cicero, NY: Program Development Associates (1-800-543-2119)

This video features real life workers with developmental disabilities and their employers. Focuses on skills needed to succeed on the job.

Look Who's Laughing

Video: 56 minutes

Cicero, NY: Program Development Associates (1-800-543-2119)

Originally shown on PBS, this funny and compelling documentary is about the lives, experiences, and humor of six working comedians who have various types of disabilities. Comedians Kathy Buckley, J.D. England, Chris Fonseca, Ales Valdez, Geri Jewell, and Brett Leake are featured.

Opportunities are Everywhere

Video: 5 minutes

Cicero, NY: Program Development Associates (1-800-543-2119)

This video demonstrates that people with developmental disabilities can achieve their goals. Primarily a motivational video designed to help staff promote integration for people with developmental disabilities.

Person First

Columbus, OH: McGuire-Willis & Associates, 1992

This resource is a language guide for communicating about people with disabilities. The guide emphasizes a "person first" approach when talking or writing about persons with disabilities. Included are sections on appropriate terminology, and an information page for people in the media that can be duplicated. For more information call 614-262-8124 or 800-231-2947.

The Ten Commandments of Communication with People with Disabilities

Video: 26 minutes

Cicero, NY: Program Development Associates (1-800-543-2119)

Based upon the United Cerebral Palsy Association's printed guidelines by the same name (see Section 2 of this Resource Guide), this video uses light-hearted humor and humorous vignettes to help you learn how to communicate respectfully and sensitively with people who have a wide range of disabilities.

VideoGuide to (Dis)Ability Awareness, A

Video: 25 minutes

Cicero, NY: Program Development Associates (1-800-543-2119)

President Bill Clinton opens and concludes this informative video on disability awareness. The video is divided into three main segments which include: etiquette and behavior—how to be comfortable and confident while engaging in activities with persons who have disabilities; how to interact effectively with people who have communications-related disabilities such as blindness and loss of hearing; and how to identify and remove unintentional barriers in your organization.

Resource List for Recreation, Integration and Advocacy*

AAMR Religion Division

UMDNJ

Brookwood II

45 Knightsbridge Road

PO Box 6810

Piscataway, NJ 08855-6810

A resource for anyone interested in developing natural supports in places of worship.

ABLEDATA

8455 Colesville Road, Suite 935
Silver Springs, MD 20910
800-227-0216

A comprehensive resource that can locate assistive technology products for people, their families, agencies, school and businesses. More than 19,000 products are on file including adapted toys, games, home and leisure, and work-related products.

Center on Human Policy

Syracuse University
200 Huntington Hall, 2nd floor
Syracuse, NY 13244-2340
315-443-3851

This center has many resources and reports on community integration.

Communitas, Inc.

Community Inclusion Booklets and Resources
PO Box 374
Manchester, CT 06045
203-645-6976

Publications include *One Candle Power: Building Bridges into Community Life for People with Disabilities*; *What are we Learning about Circles of Support?*; *Dare to Dream*; and *Person-Centered Development*.

Concrete Change

1371 Metropolitan Ave., SE
Atlanta, GA 30316
404-378-7455

Publications include *Building Better Neighborhoods*, a 15-minute video showing how to build accessibility into all homes.

Consortium for Collaborative Research on Social Relationships

Dr. Luanna Meyer
School of Education
150 Huntington Hall
Syracuse University
Syracuse, NY 13244-2340
315-443-9651

Publications include *Inclusive Schools and Communities for Children and Youth with Diverse Abilities*. Call or write for a list of available materials.

Incitement

1339 Lamar Square Drive #B
Austin, TX 78704
512-442-0252

A free publication/newsletter of ADAPT, a grassroots organization for people with disabilities. The newsletter contains information from around the country.

Inclusion News

Marsha Forest & Jack Pearpoint (editors)
Centre for Integrated Education and Community
24 Thome Crescent
Toronto, Ontario M6H 2S5

Write for information about this newsletter.

Kaleidoscope: International Magazine of Literature, Fine Arts & Disability

326 Locust Street
Akron, OH 44302
216-762-9755

Write or call for information about this newsletter.

Mouth

61 Brighton Street
Rochester, NY 14607

Mouth is an off-the-wall "voice of disability rights" magazine published six times per year. Send your request for information along with a self-addressed stamped envelop to the address above.

National Council on Independent Living (NCIL)

2111 Wilson Boulevard, Suite 405
Arlington, VA 22201
703-525-3406

To obtain the name of a Center for Independent living near you, call the NCIL.

National People First

1031 Rosewood Lane
Tacoma, WA 98466
206-565-3091

Learn how to set up an advocacy group in your hometown. Call or write for information.

One Step Ahead

1050 Connecticut Avenue, NW, Suite 1250
Washington, DC 20036
800-386-5367

A newsletter that is published twice per month by people with disabilities for other people with disabilities, their families, and their friends.

Paul H. Brooks Publishing

PO Box 10624
Baltimore, MD 21285
800-638-3775

A large selection of books about recreation, friendships, and community integration are available through this publisher.

Silent News

Silent News, Inc.
1425 Jefferson Road
Rochester, NY 14623-3139
716-272-4900 (V/TTY)

A monthly newspaper for and about persons who are deaf and the issues that affect them.

Training Resource Network, Inc.

PO Box 439
St. Augustine, FL 32085
904-823-9800

Publications include *Reach for the Dream! Developing Service Plans for Persons with Disabilities*. Call or write for a list of available materials.

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